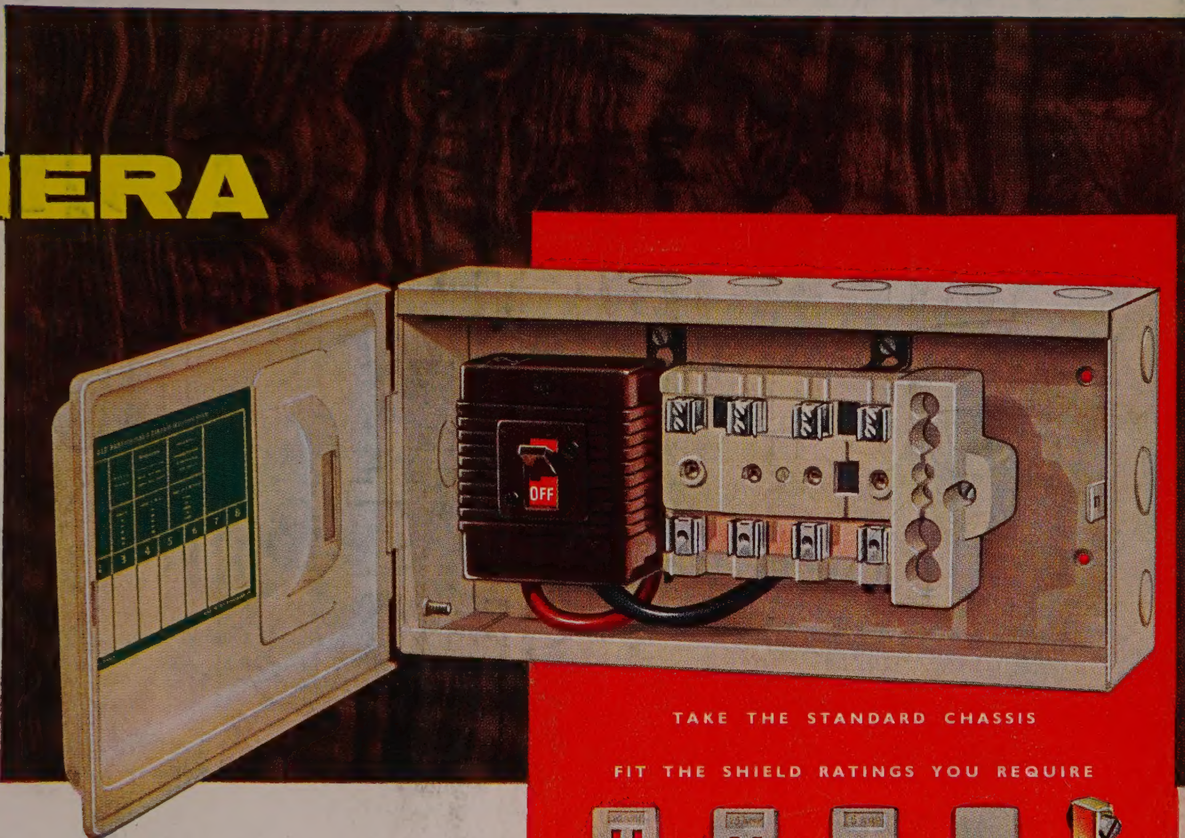
ELECTRICAL REVIEW

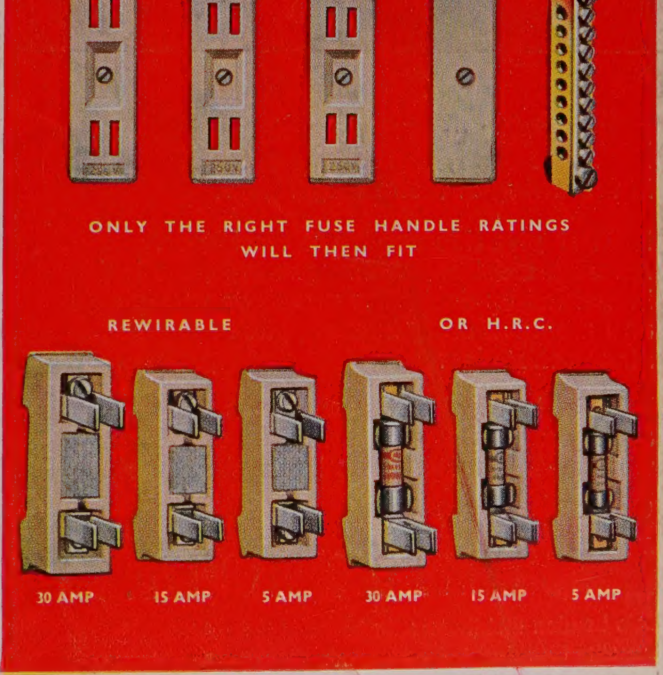
FRIDAY
28 APRIL 1961

WEEKLY
PRICE 1s 6d

MEMERA

the unit which set a new high standard in the industry





If the job calls for unusual fuse combinations, it's no trouble at all with Memera. No other equipment gives you the same versatility as Memera.
The system is so delightfully simple. The chassis is the same for all combinations. Just fit the appropriate shields to suit the fuse ratings you need for the job. Once these are fitted, only the correctly rated fuse handles can be inserted.
And of course with Memera there is the big advantage that you can use either rewirable or H.R.C. fuses.

MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

RIST'S

RIST'S CABLE ASSEMBLIES SUPPLIED TO PRESTCOLD

PRESTCOLD use RIST'S preformed wiring sets to ensure safety and reduce production costs in the wiring of their refrigerators.

RIST'S give this service to the Motor, Aircraft, Electronics, and general electrical industries by designing prototype wiring sets and manufacturing bulk supplies to strict schedules.

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Sole London distributors for housewiring cables and flexibles:
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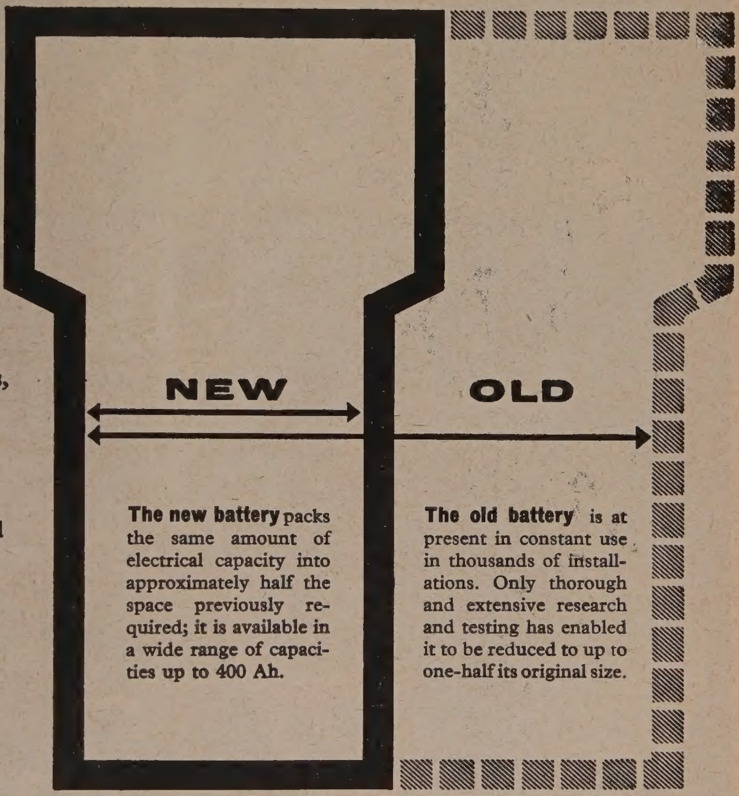
BATTERY SPACE REDUCED BY HALF

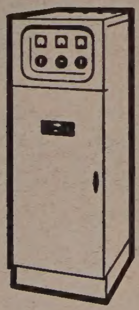
WITH THE NEW TUDOR HIGH PERFORMANCE STATIONARY CELL

Savings of up to 50% in the space required for a stationary battery are made with the introduction of a new Tudor cell. A high performance sealed cell with Planté positive plates and pasted grid negative plates, separated by ribbed diaphragms of microporous Porvic, it is specially designed for trickle-charge operation.
It is therefore the ideal cell for all stand-by applications, including emergency lighting in hospitals, cinemas, theatres and public buildings of all kinds, and auxiliary duties in both nuclear and conventional power stations.
The design of the cell results in a lower internal resistance and therefore provides a very much improved high rate performance, making it eminently suitable for switch-operating duties where high rates of discharge are involved.
With the great reduction of space required, and the renowned reliability and long life of its predecessors, this new Tudor high performance cell marks a great step forward in stationary battery design.



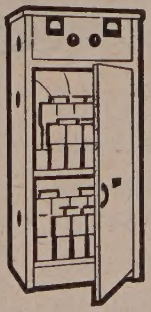
The new battery packs the same amount of electrical capacity into approximately half the space previously required; it is available in a wide range of capacities up to 400 Ah.

The old battery is at present in constant use in thousands of installations. Only thorough and extensive research and testing has enabled it to be reduced to up to one-half its original size.



THE IMPROVED SAFETYLYTE EMERGENCY LIGHTING EQUIPMENT

Tudor Safetylyte equipments are now being fitted with the new stationary cell. Charge and control cubicles are of improved design – the larger equipments being of folded sheet steel, and the smaller specially constructed for wall-mounting, employing automatic mercury relay in place of a contactor.



THE NEW SWITCH-TRIPPING EQUIPMENT

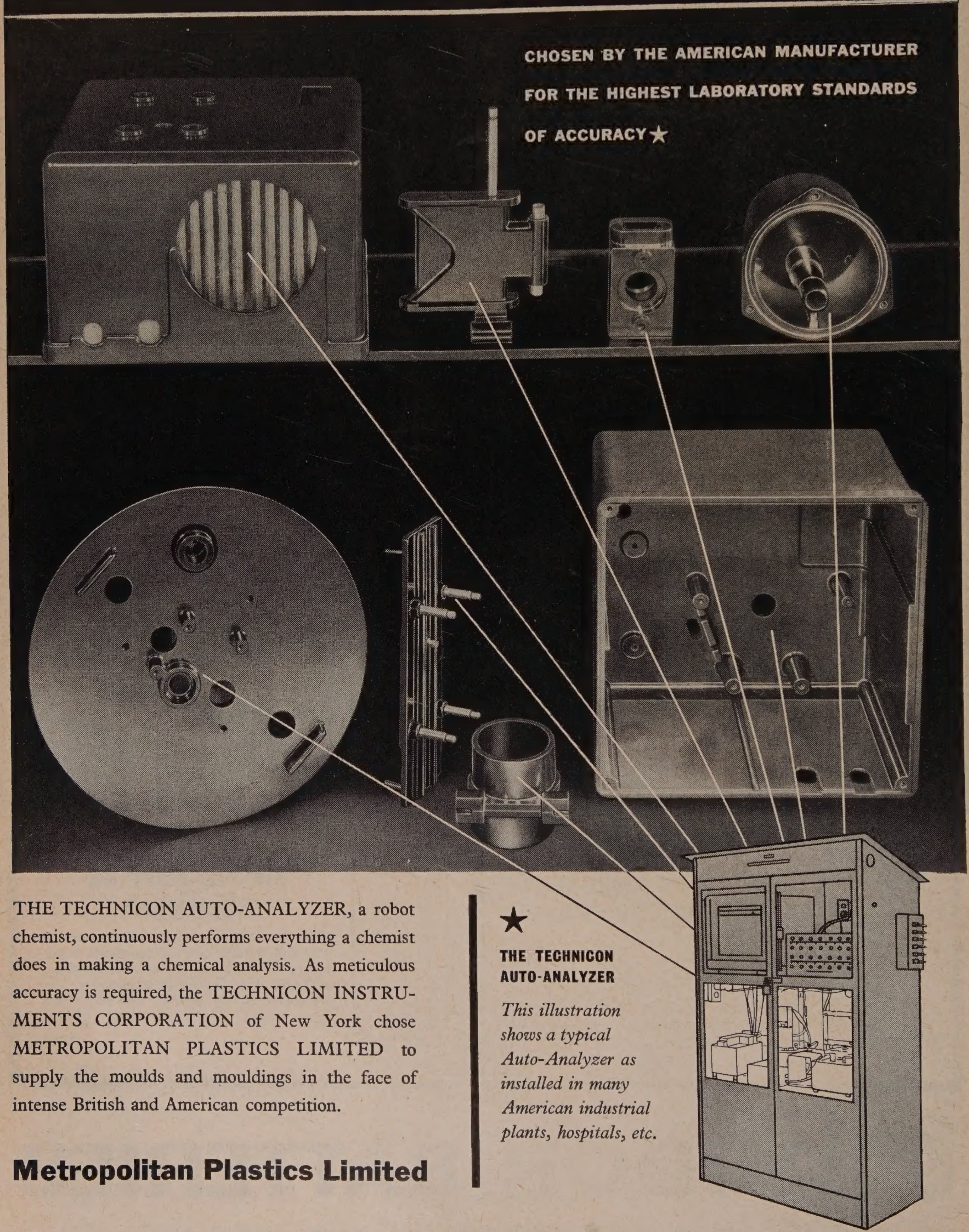
Tudor switch-tripping units will in future be fitted with the new cell. The cubicles have also been redesigned, and are available in folded sheet steel or wooden cabinet construction. The charger can now be used for both trickle and quick charging.

T 173A

Tudor TUDOR BATTERIES

THE D.P. BATTERY CO. LTD, MAKERS OF KATHANODE AND TUDOR BATTERIES, BAKEWELL, DERBYSHIRE. TEL BAKEWELL 581-5

Metropolitan Plastics Limited


CHOSEN BY THE AMERICAN MANUFACTURER
FOR THE HIGHEST LABORATORY STANDARDS
OF ACCURACY ★

THE TECHNICON AUTO-ANALYZER, a robot chemist, continuously performs everything a chemist does in making a chemical analysis. As meticulous accuracy is required, the TECHNICON INSTRUMENTS CORPORATION of New York chose METROPOLITAN PLASTICS LIMITED to supply the moulds and mouldings in the face of intense British and American competition.

★

THE TECHNICON AUTO-ANALYZER

This illustration shows a typical Auto-Analyzer as installed in many American industrial plants, hospitals, etc.

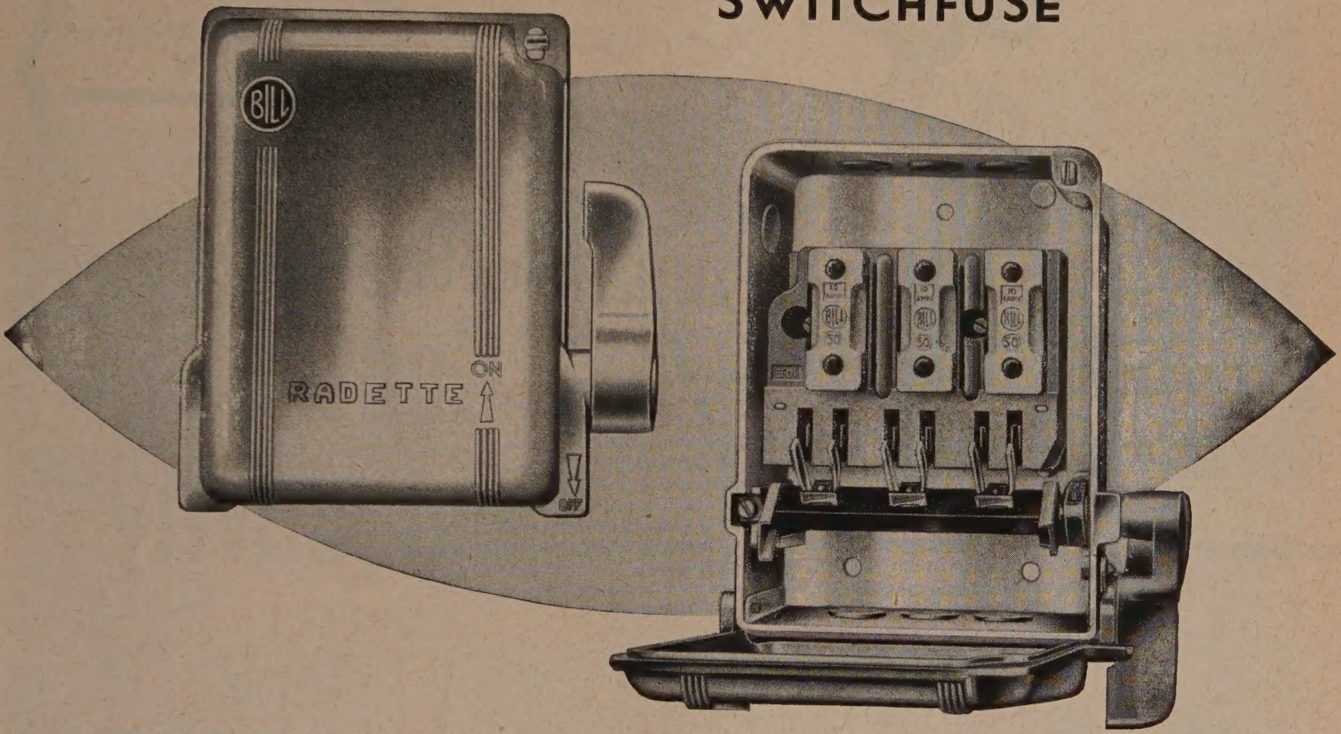
Metropolitan Plastics Limited

Faraday Way · St. Mary Cray, Kent · Telephone: ORPINGTON 31631 · *The Technical Moulding Specialists*

You cannot buy better gear

BILL RADETTE Q1438 MARK II

THE MODERN MOTOR CONTROL SWITCHFUSE



- DESIGNED FOR CONTROLLING SMALL MOTORS NOT EXCEEDING 5 H.P.
- 10 AMPERE 500 VOLTS, 3 PHASE, QUICK MAKE AND BREAK SWITCH WITH SUBSTANTIAL CONTACTS FOR HIGH CONTACT EFFICIENCY AND LONG LIFE
- BILL ARC DAMPING TYPE FUSES FITTED COMPLETE WITH FUSE WIRE BY QUICK ACTION CLAMPS
- AMPLE KNOCKOUTS AND GENEROUS WIRING SPACE PROVIDED. 3—¾″ KNOCKOUT HOLES TOP AND BOTTOM. 1—¾″ KNOCKOUT HOLE IN LEFT HAND SIDE FOR STARTER CONNECTION.
- 'THROUGH' WIRING ARRANGED UNDER THE SWITCH BASE
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- FINISHED IN BILL SILVERLOSE— A DURABLE STOVED ALUMINIUM ENAMEL

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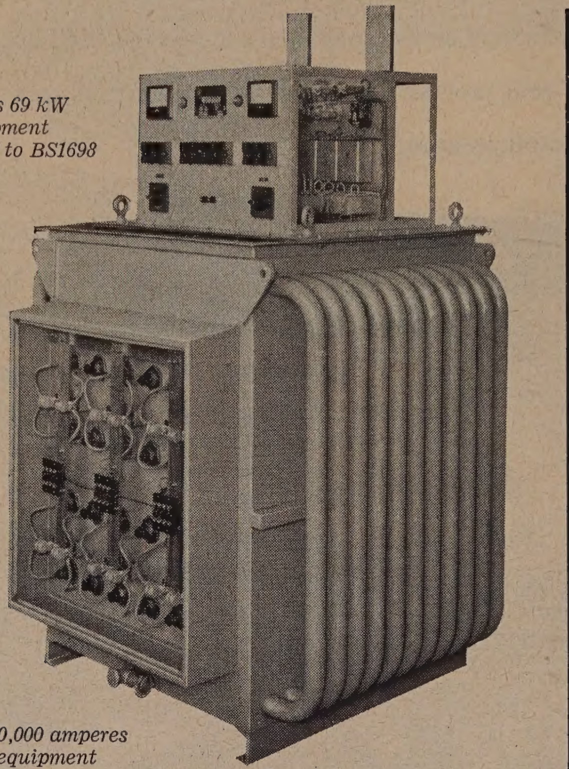
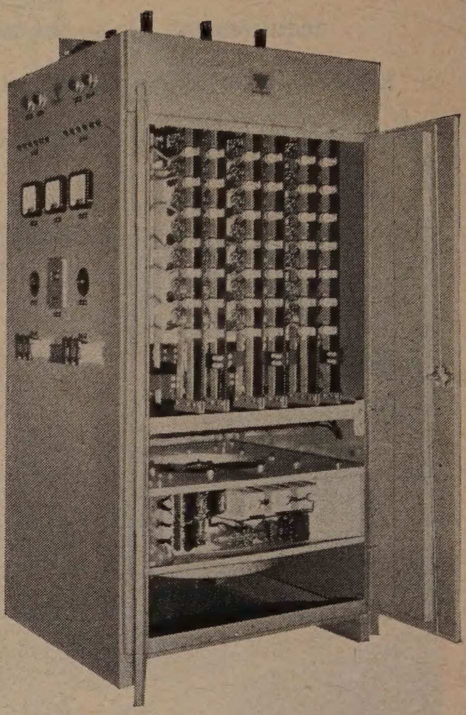
SILICON RECTIFIER EQUIPMENT

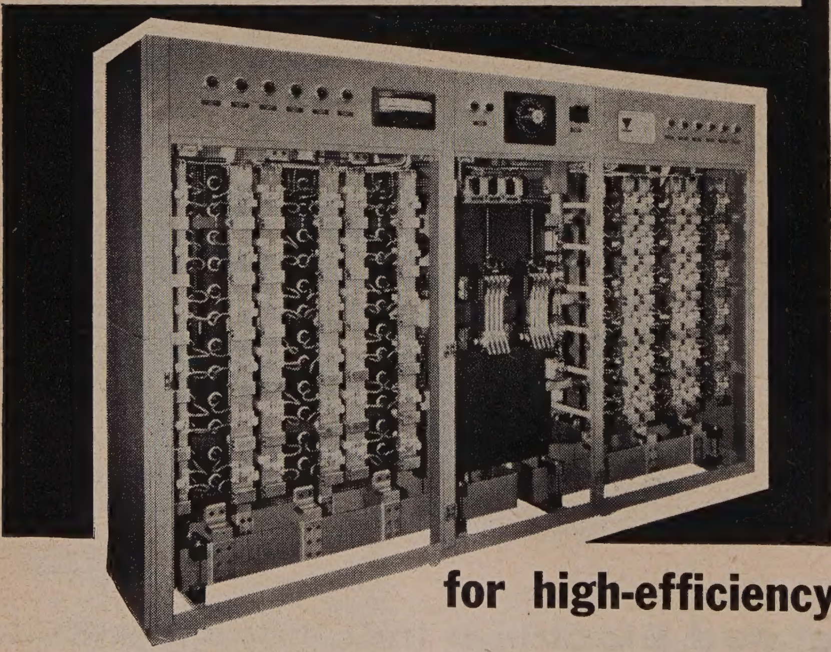
115 Volts 600 amperes 69 kW silicon rectifier equipment Overloads to Class V to BS1698



Part of a 65-130 Volts, 20,000 amperes 2·6 MW silicon rectifier equipment Overloads to Class II BS1698



240/480 Volts 3 wire 1000 amperes 480 kW silicon rectifier equipment Overloads to Class II BS1698



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- Metallurgical and chemical industries

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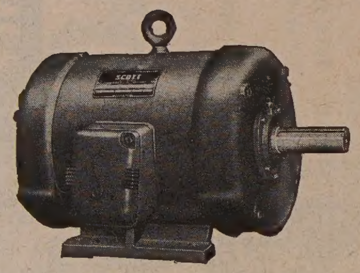
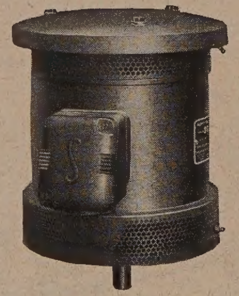
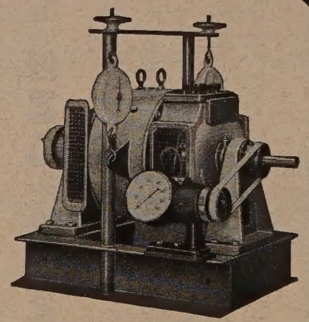
ALTERNATORS ½-125 K.V.A., MOTOR GENERATOR SETS
GENERATORS ½-150 K.W., INVERTED ROTARY CONVERTERS
MARINE MOTORS, ETC.



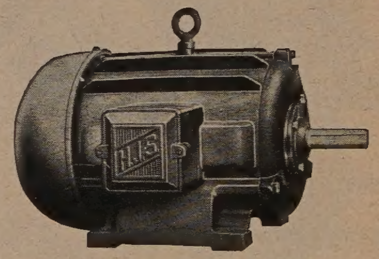
A.C. DRIP PROOF MACHINE



A.C. VERTICAL FLANGE TYPE



DYNAMOMETER FOR COLLEGE USE



TOTALLY ENCLOSED FAN COOLED MOTOR

HUGH J. SCOTT & CO. (BELFAST) LTD., VOLT WORKS, BELFAST 6, N. IRELAND

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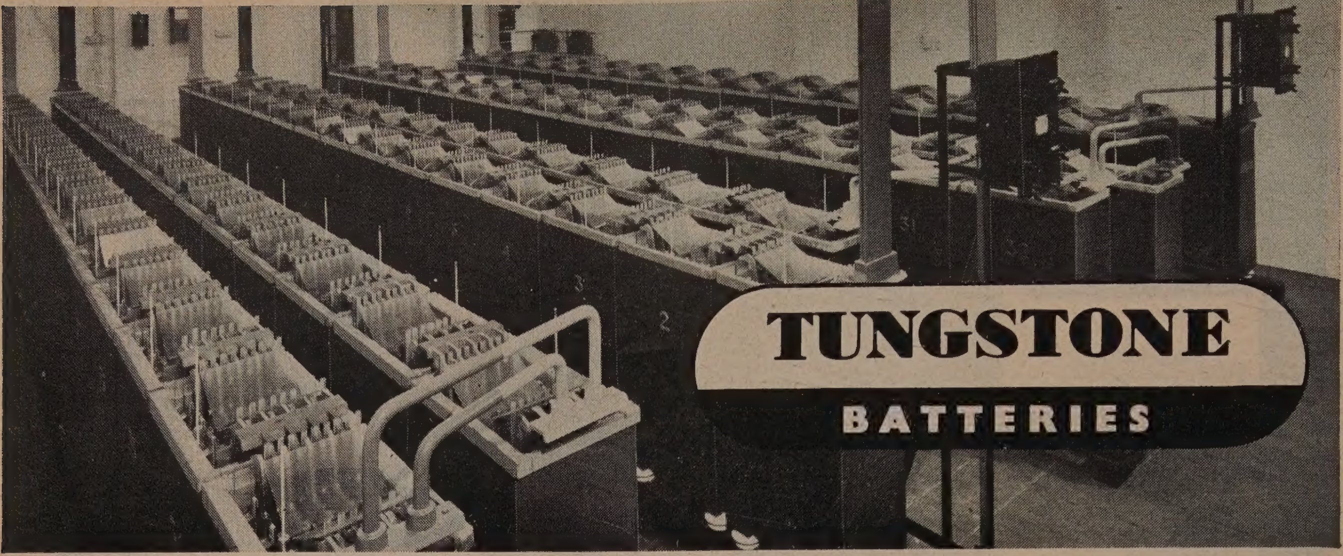
TELEGRAMS: AMPERES, BELFAST



TUNGSTONE BATTERIES have been designed to meet Post Office, British Standards and other national Post and Telegraph Specifications. They are being used in Power Stations, Telephone Exchanges, etc., all over the United Kingdom, Australia, India, South Africa, West Africa, West Indies, Venezuela, etc.

This illustration shows . . . the installation of a 126 cell TUNGSTONE Battery, Type BSSFW9 giving capacity of 800 a.h. at the 9 hr rate.

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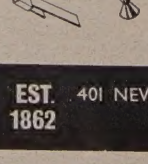

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Specialists in miniature and sub-miniature press work in all ferrous and non-ferrous metals.

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Unlike the giraffe, we are not sticking our neck out with this statement. It is strictly true.

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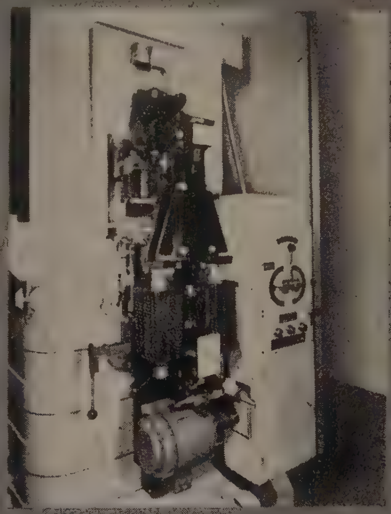

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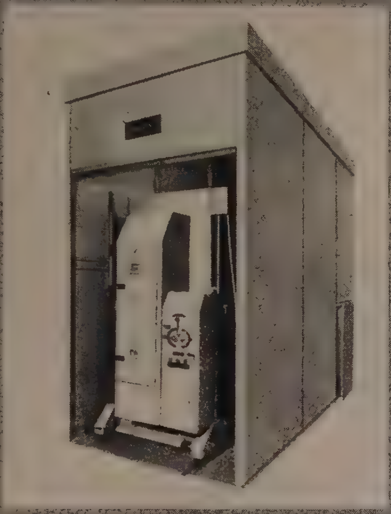

O.C.B./C.T. CHAMBER MOVING PORTION
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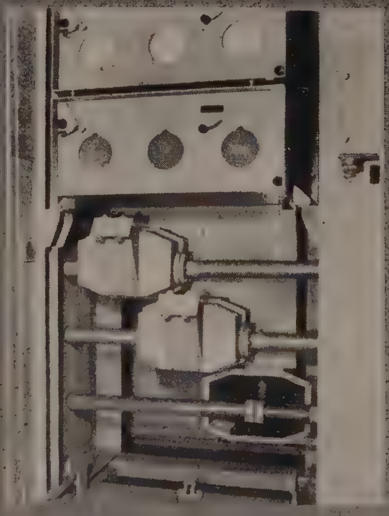

CONDENSER TYPE BUSBARS WITH
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A COMPACT SELF CONTAINED WEATHERPROOF
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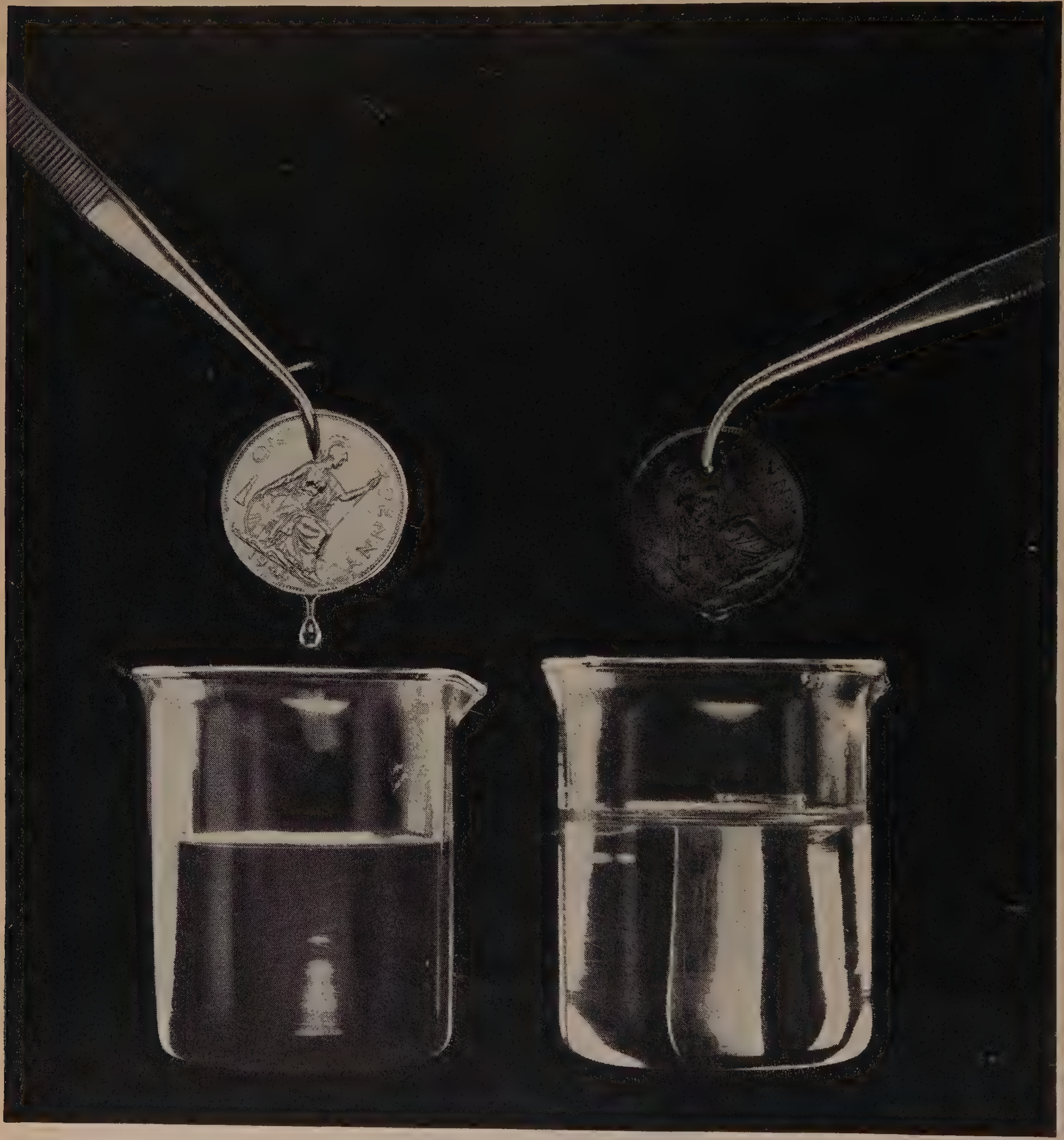
Shell demonstration



Two clean, bright pennies are placed in beakers of oil, of equal performance level, one Shell Garia Oil 21, the other a conventional cutting oil containing sulphurised additives. After three hours at room temperature one penny is still bright and stain-free, the other heavily stained with black copper sulphide. The bright penny is from the beaker containing Shell Garia Oil 21, the blackened one from that containing the conventional oil. While these were just pennies they could have been bronze bushes in your machine tools—stained in less than half a shift. Sulphur is essential in heavy-duty cutting oils. Special additives in Shell Cutting Oils protect your machine tools and yet allow the sulphur to do its job. *Write for the book "Selecting Your Cutting Oils" to Lubricants Department, Shell-Mex House, London, W.C.2.*

DROMUS . . . PELLA . . . MACRON . . . GARIA

SHELL

SHELL CUTTING OILS

Aluminium sheathed cables—a growing market

VER 100 miles of aluminium tube is rolled on to drums like
hese at Rogerstone, Monmouthshire, every month; it goes
cable makers all over England. More material leaves in
e form of strip, for those cable makers who make their
n tube by seam welding. These tubes become sheathing
r insulated cables.

Four main classes of cable are being made with aluminium
eaths.

Supertension Power Cables

hese are filled with gas or oil under pressure. Aluminium
eaths can resist this pressure without reinforcement. Pres-
re-type cables with aluminium sheaths are notably smaller
d lighter, and cheaper, than alternative constructions.

Paper Insulated Power Cables

uminium sheathed cables are being increasingly used for
wer distribution in factories of all kinds. The advantages
aluminium over other cladding materials include—lightness, strength, economy, good resistance to corrosion, and the ability to withstand vibration.

Rubber or Plastic Insulated Wiring Cables

In factories or office buildings, aluminium sheathed cables provide neat and cheap installations; many orders today are repeat orders from satisfied customers.

Telecommunication Cables

Here aluminium's advantage is its good conductivity. An aluminium sheath screens the communication circuits against interference from near-by power cables, and prevents dangerous build-up of induced voltages.

Ask your cable supplier to quote you for aluminium sheathing next time you enquire for cables. For further information write to: Alcan (U.K.) Limited, Aluminium Canada House, 30 Berkeley Square, London, W.1. Telephone MAYfair 9721.

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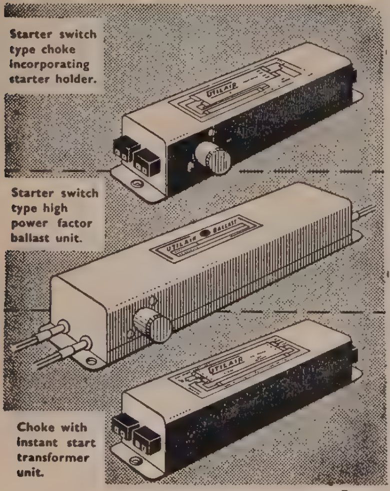
BRITAIN'S BEST FLUORESCENT LIGHTING FITTINGS & CONTROL GEAR


Starter switch type choke incorporating starter holder.
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Starter switch type high power factor ballast unit.
UTILAIR Ballast
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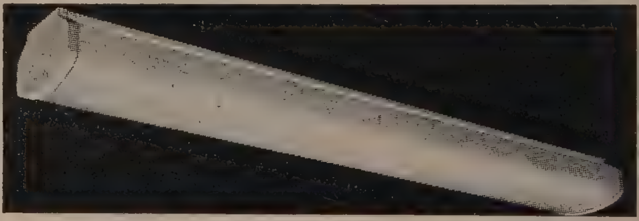
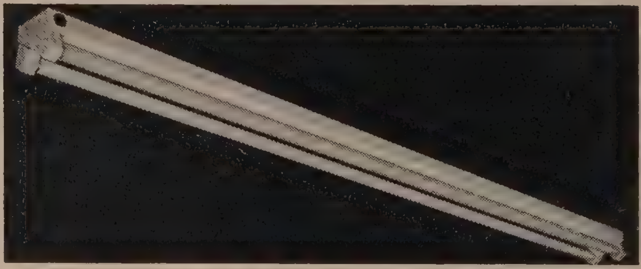
Choke with instant start transformer unit.

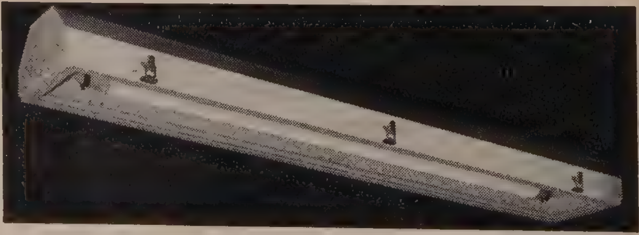
Britain's best range of Fluorescent Fittings selected for efficient lighting by famous concerns all over the world



Model EP.802 Suspended or ceiling fitting with opal fluted diffusing cover



Model D.2125 Twin 8ft. 125 watt batten fitting



Model VP.802 Industrial vapour-proof totally enclosed fitting

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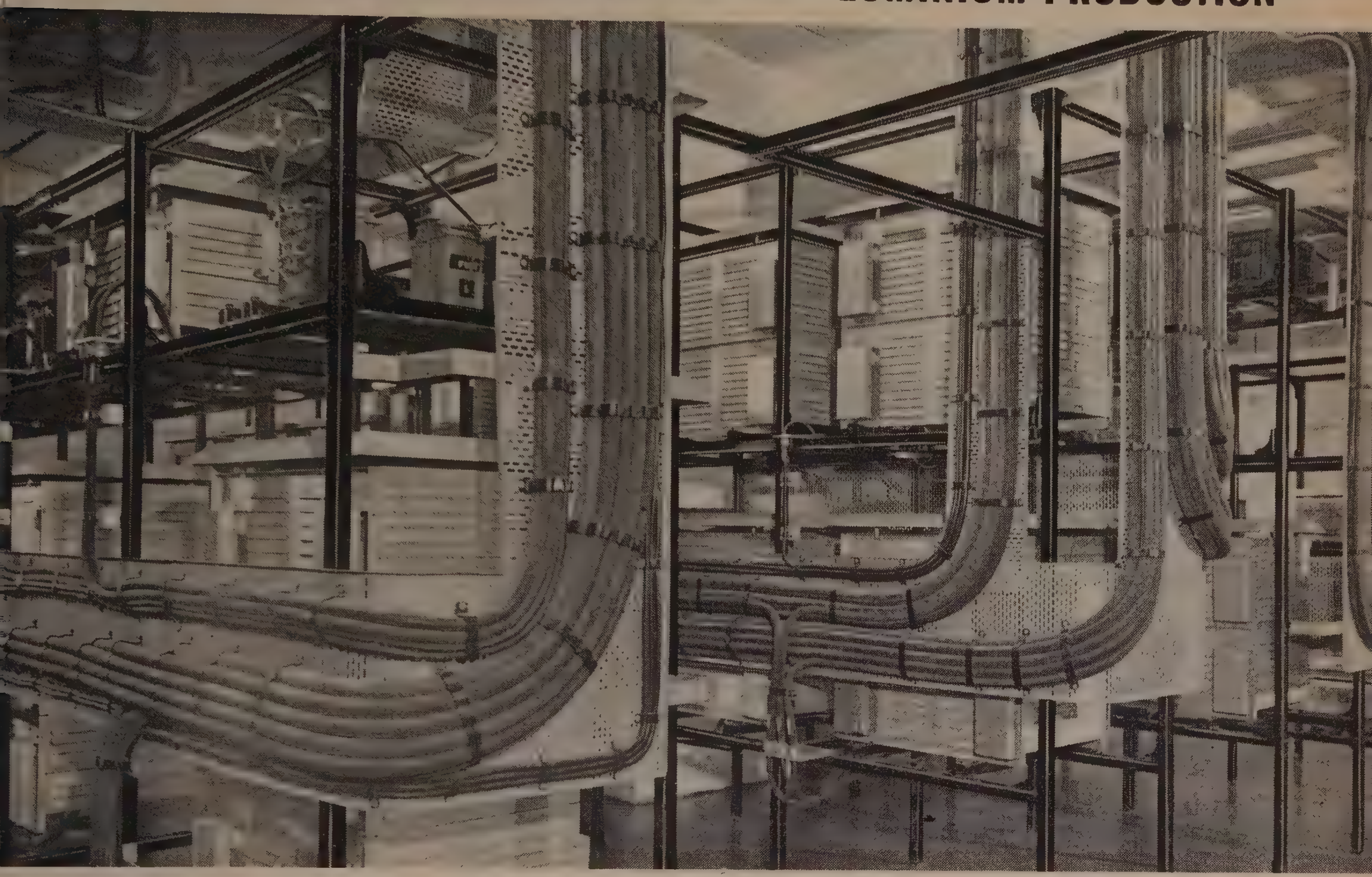
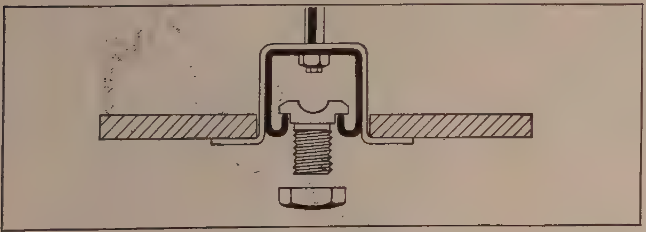
UNISTRUT

CHOSEN FOR ALCAN INDUSTRIES TO AID ALUMINIUM PRODUCTION



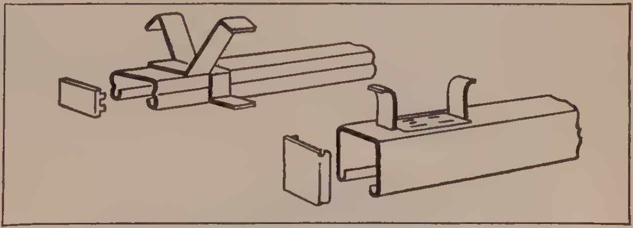
UNISTRUT STEEL CHANNEL FRAMING AND SUPPORT SYSTEM has been chosen for Alcan Industries Ltd., at Rogerstone, Newport, to support multi-services to mills, furnaces and machinery. With a vast expansion scheme underway, Alcan's engineers found Unistrut the ideal answer to a complexity of support problems. Unistrut supported miles of electrical cable, bus-bars, switch gear, resistances, etc., in a way which would allow for additions and alterations and offer easy maintenance access.

UNISTRUT ELECTRICAL FITTINGS



The Unistrut System comprises basic steel channel which, by means of a patented self-locating nut assembly, accepts a wide variety of trunking fittings such as fluorescent lighting adaptors, conduit end connections, junction boxes, and the new 'Top Hat' section, a unique method of simultaneously supporting false ceilings and fluorescent lighting units.

UNISTRUT CONCRETE INSERTS



At Alcan, Unistrut concrete inserts were cast in flush to roofs and ceilings to provide attachment points for the main busbar support system, to which could be added supports for lubricating oil pipes, service mains and fluorescent lighting fittings. In walls, inserts hold the runs of electrical cables, whilst in floors they were used to locate switchboards.

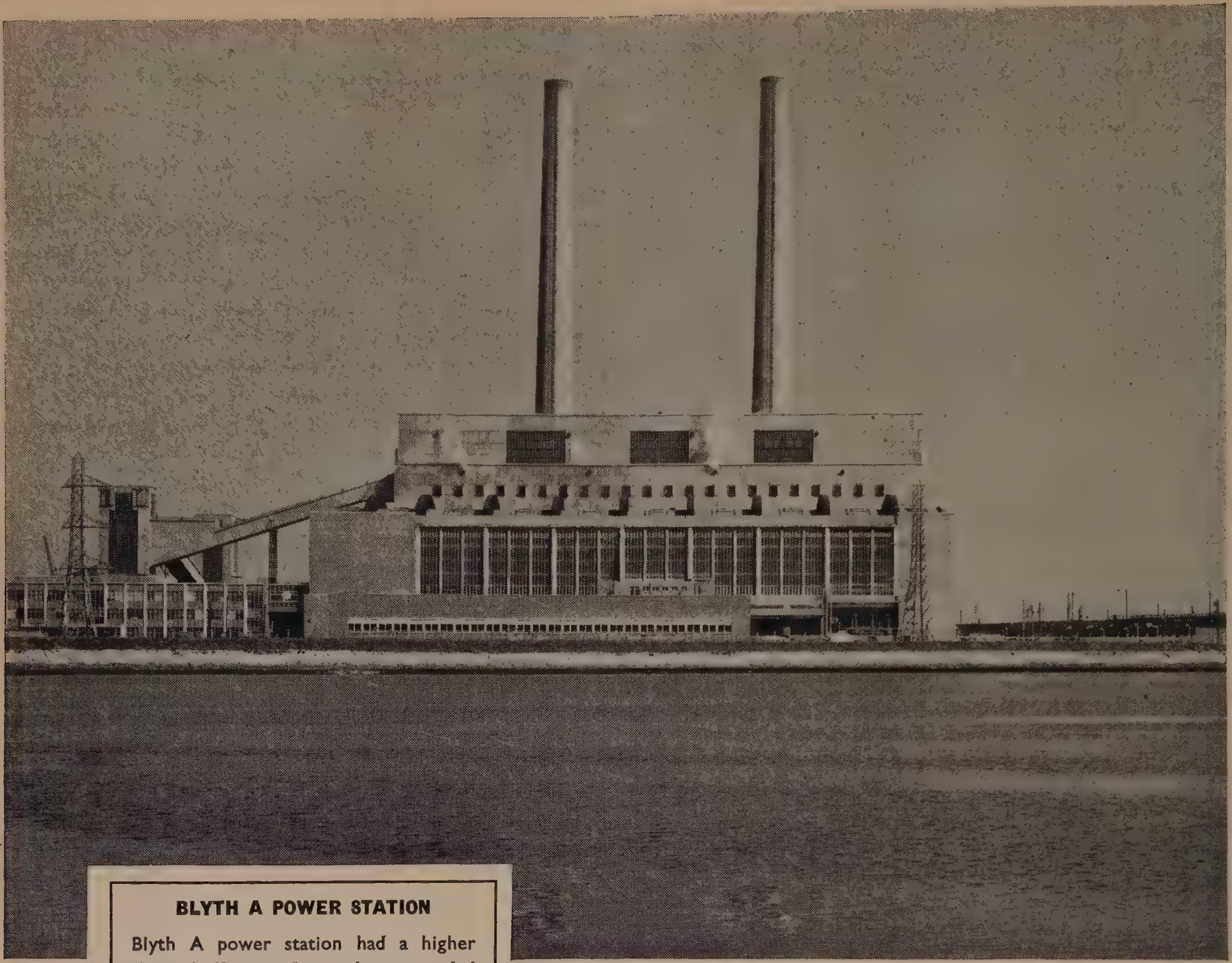
For details of Unistrut electrical components,
and information on the Unistrut System in all electrical applications, please write to:

A MEMBER OF THE GKN GROUP OF COMPANIES

UNISTRUT DIVISION OF SANKEY-SHELDON LTD.

43/45 Broadwater Road, Welwyn Garden City, Herts. Tel: Welwyn Garden City 26321 (4 lines)

UNI [illegible]



BLYTH A POWER STATION

Blyth A power station had a higher thermal efficiency during the year ended 31st Mar., 1960, than any other power station in Great Britain. The motors driving the auxiliaries are protected by P & B Golds relays in this and many other power stations of the Central Electricity Generating Board.

Consulting Engineers—Messrs. Merz & McLellan

C·E·G·B chose P&B Golds protection

P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.
P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.
P & B Stalling Relays give complete protection against stalling under all conditions. Send for current literature.

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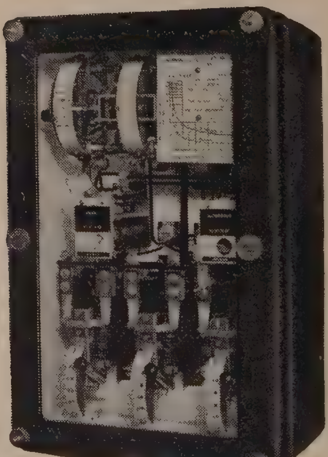
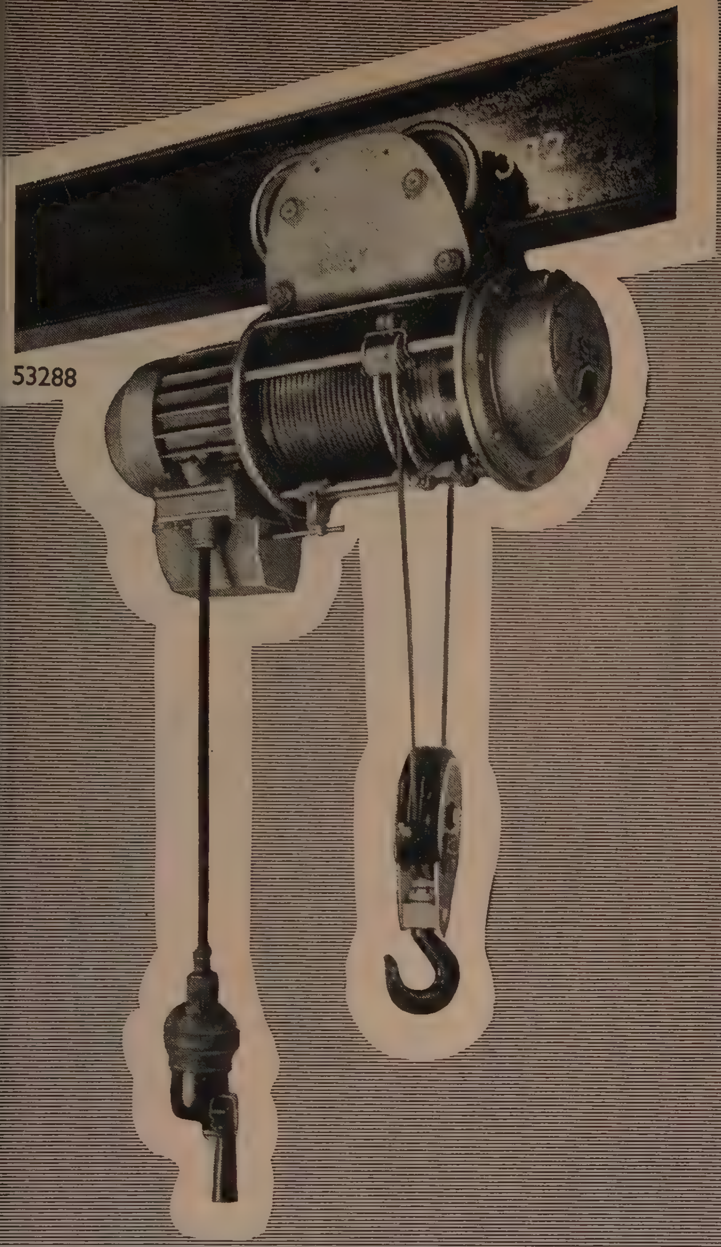
CROMPTON WAY
CRAWLEY · SUSSEX
Telephone: Crawley 1004





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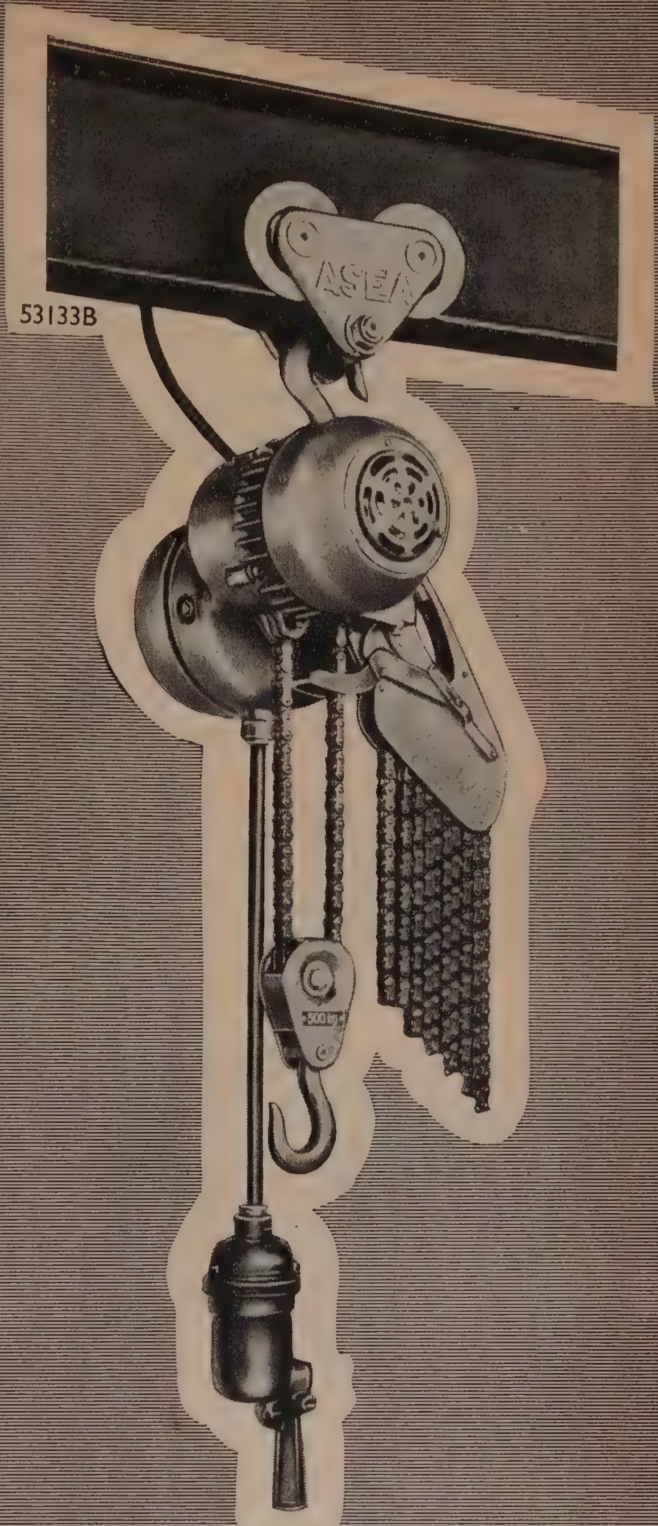

53133B

53133B 5 cwt. and 10 cwt. capacity Roller Chain Hoists. (Type TEA) with single and two speed lifting. Hook and trolley suspension.
53288 1 ton Wire Rope Hoists (Type TMA) with single and two speed lifting.

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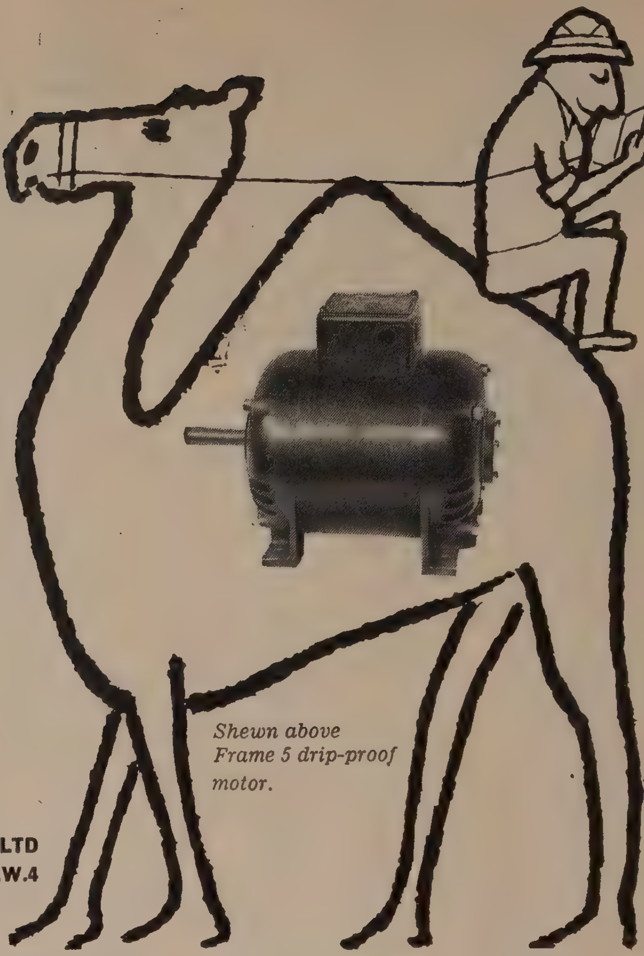

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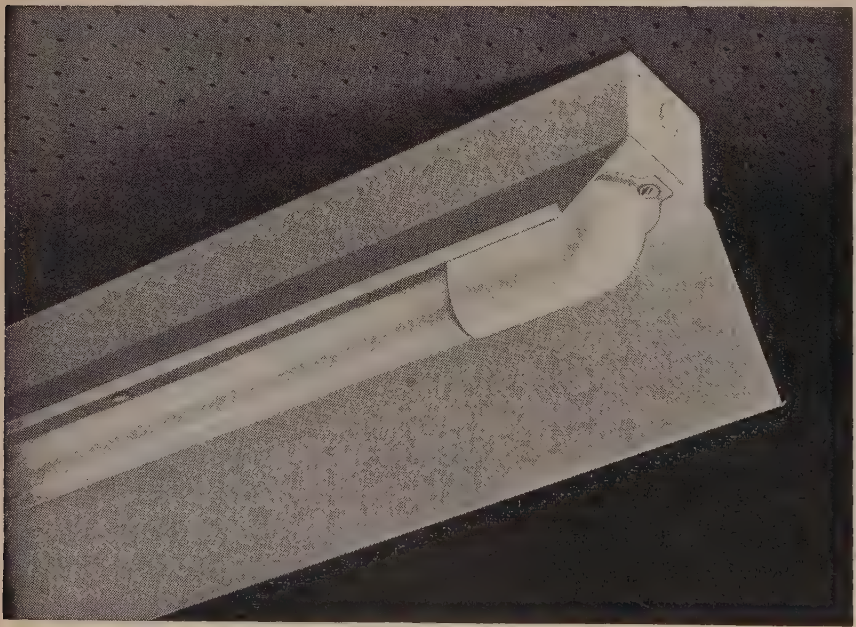

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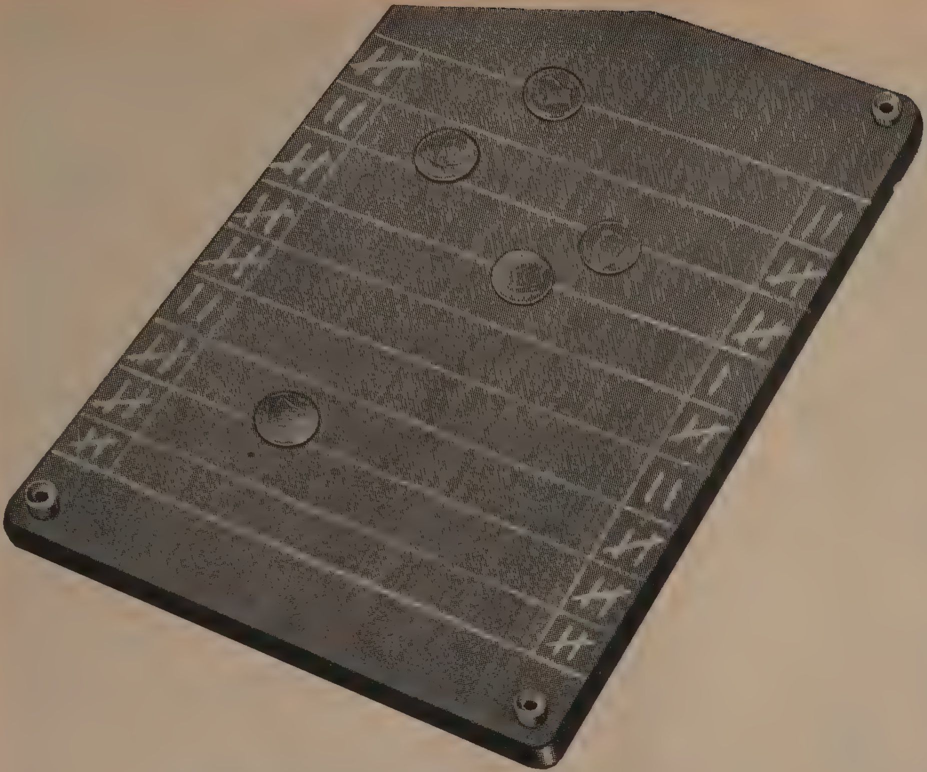

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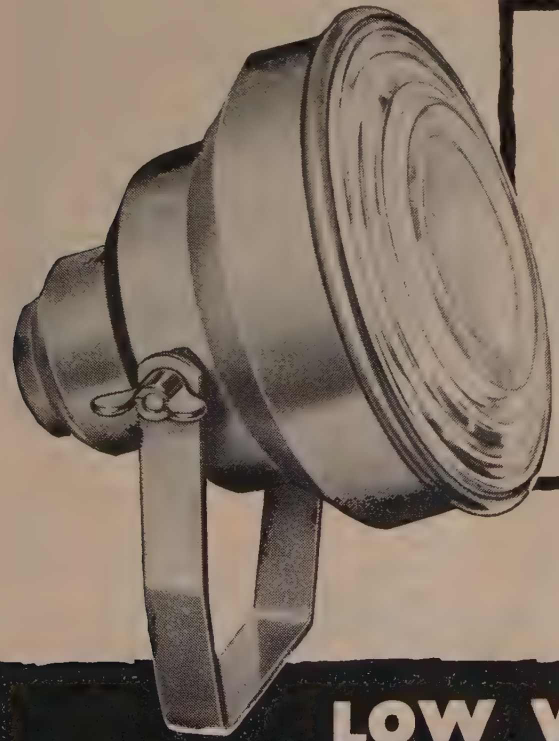

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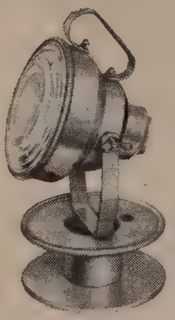

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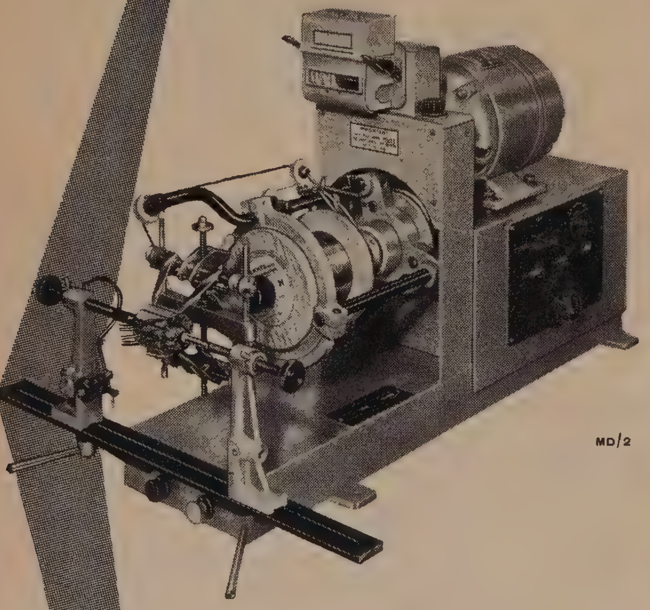

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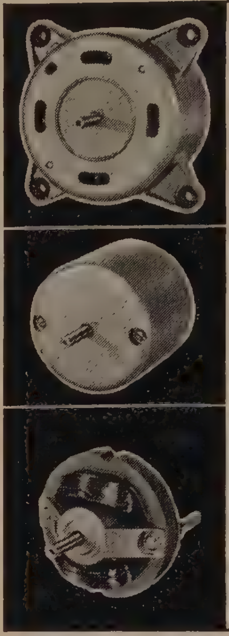

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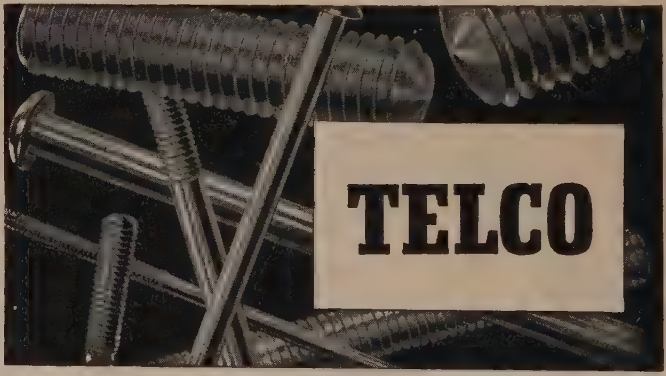

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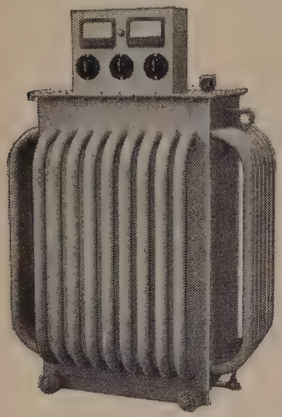

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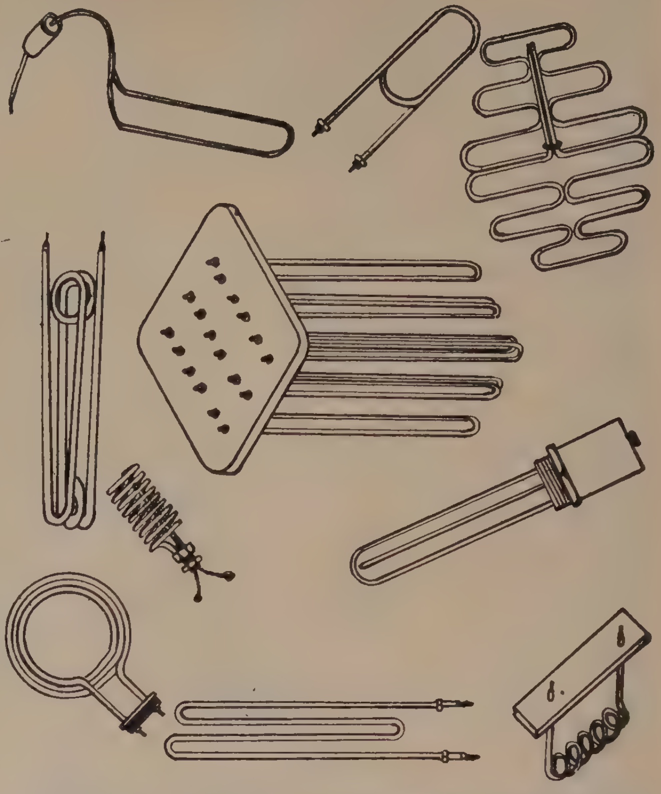

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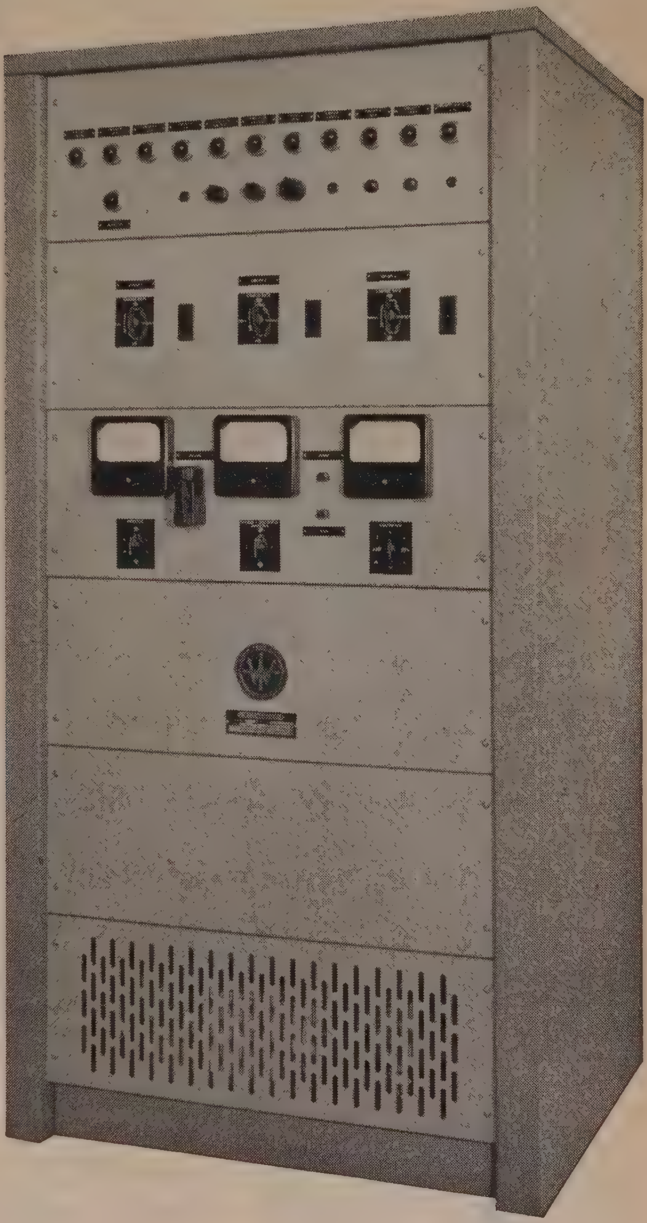

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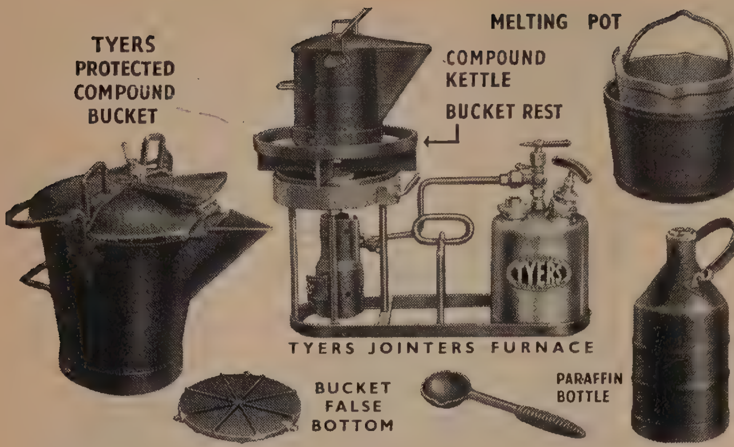

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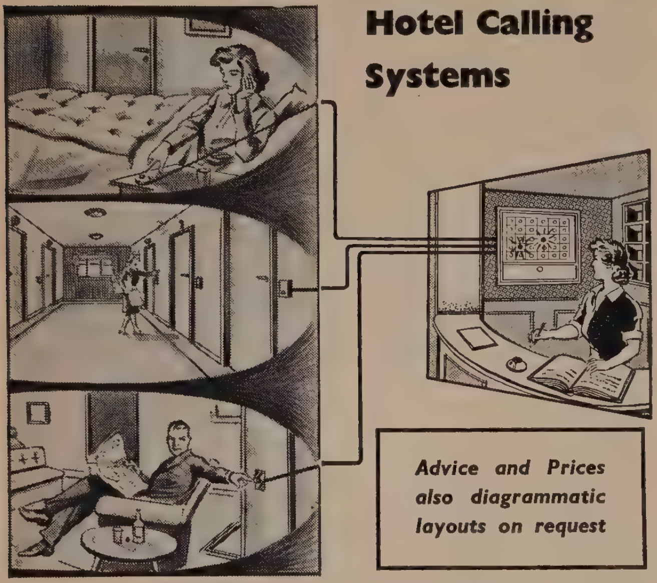

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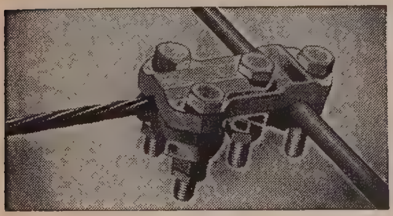

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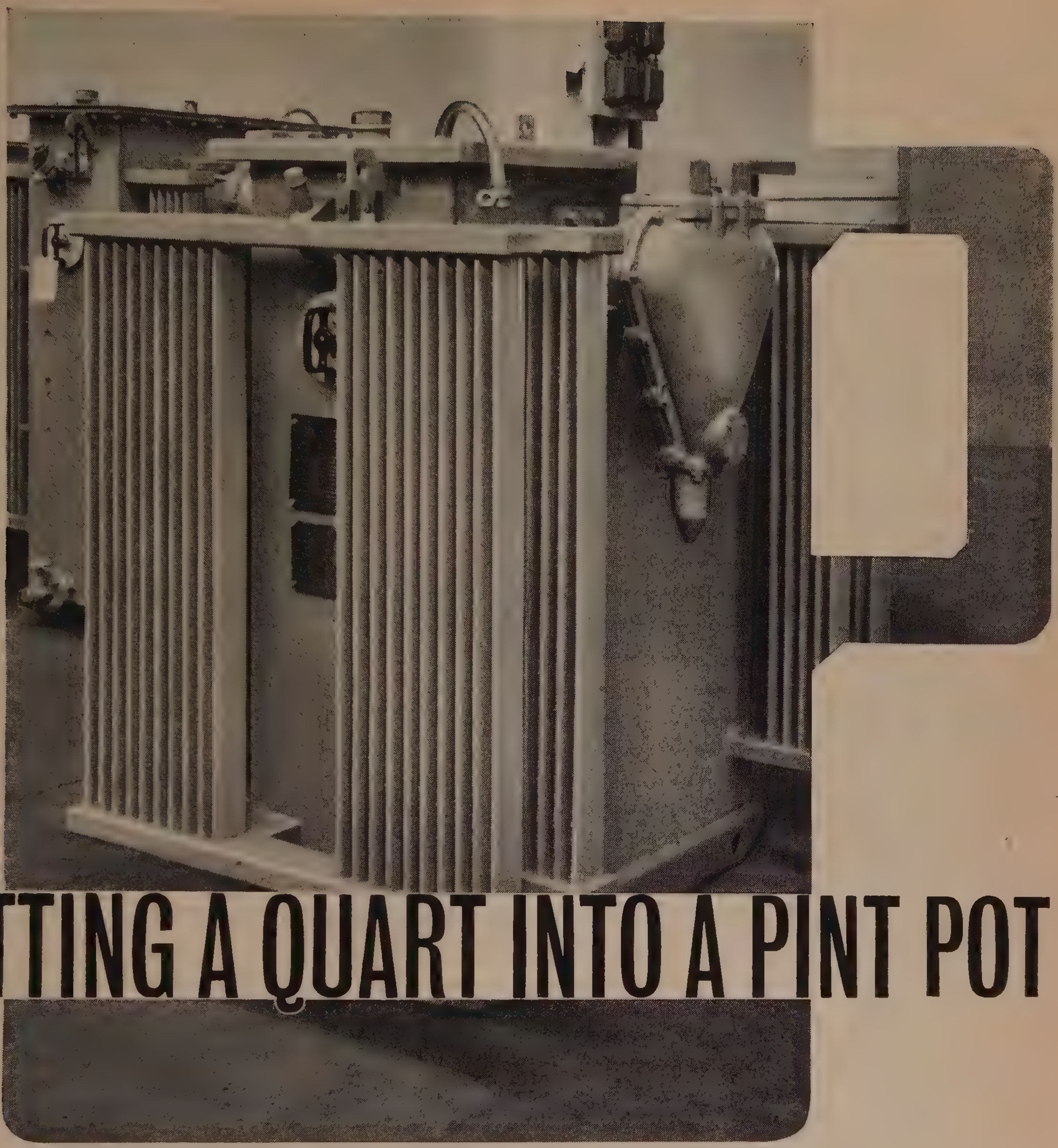

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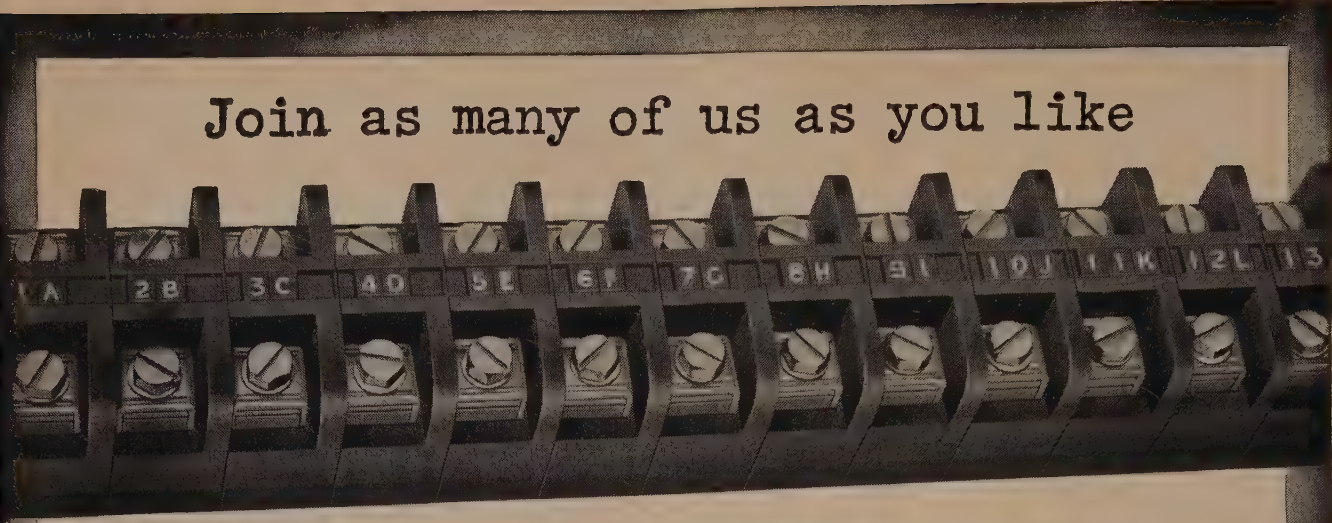

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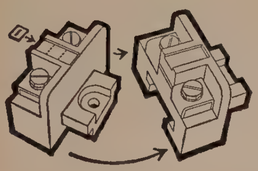

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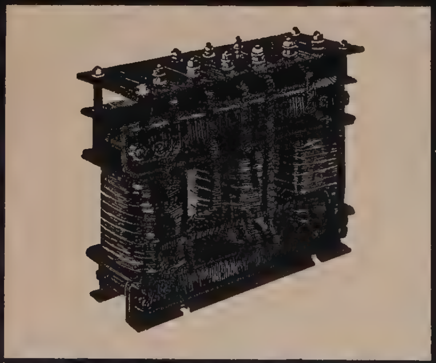

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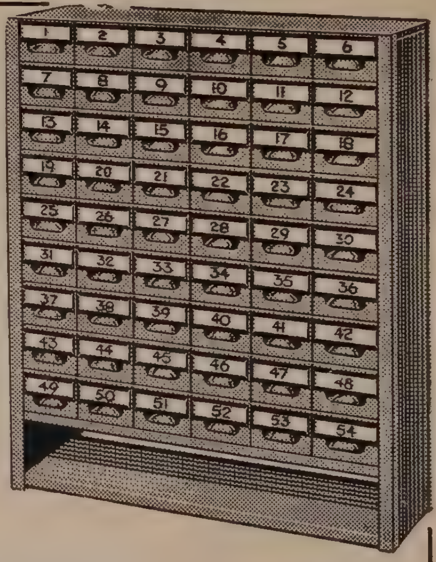

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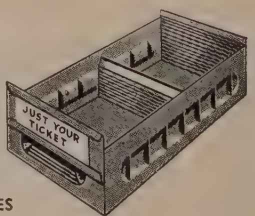

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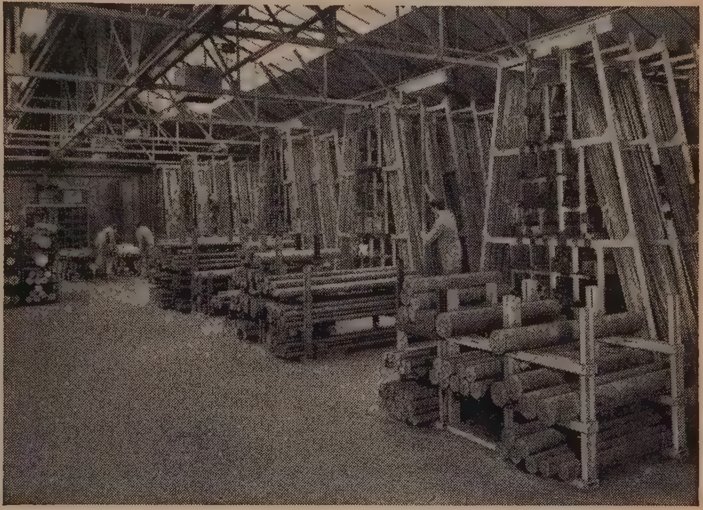

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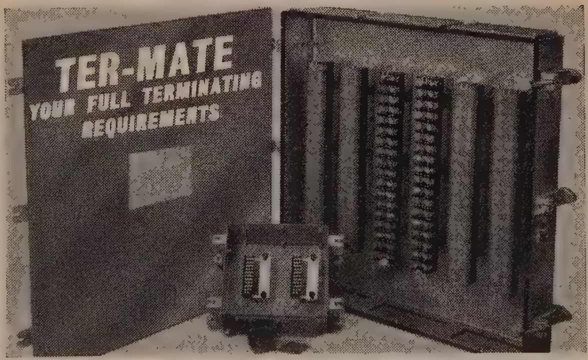

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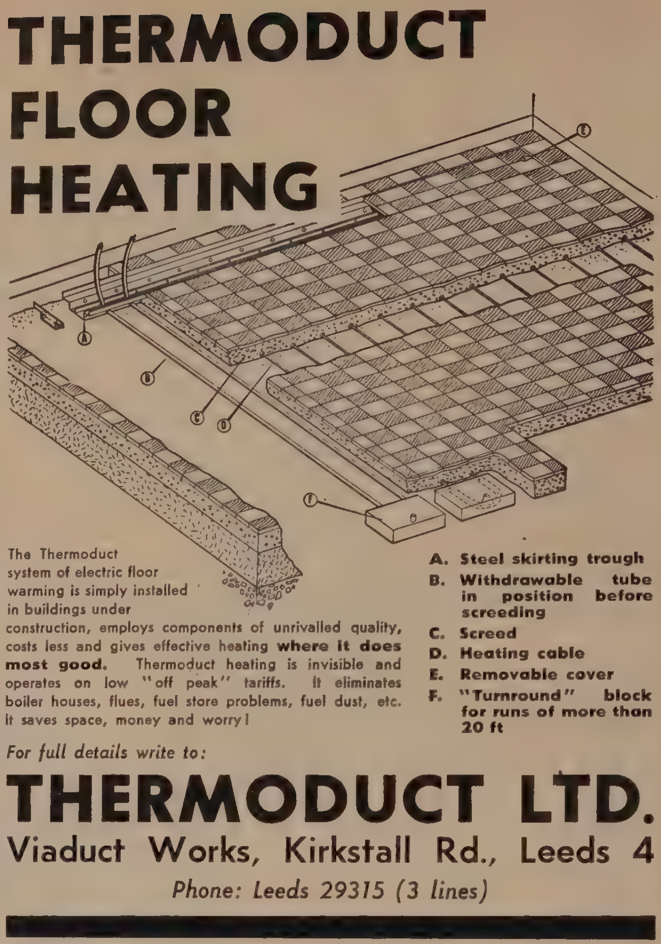
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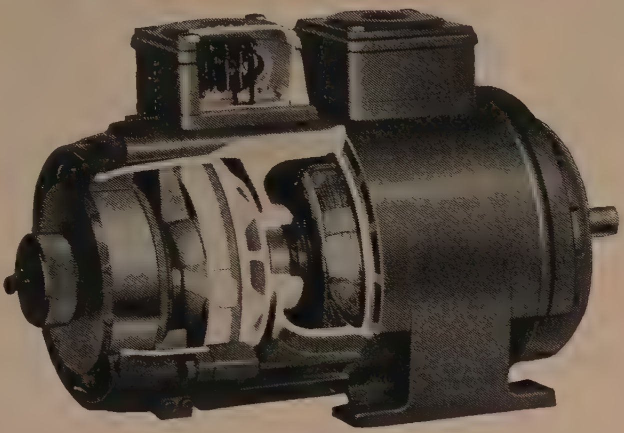

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★ It will pay you to know more about the F59. For full details contact—

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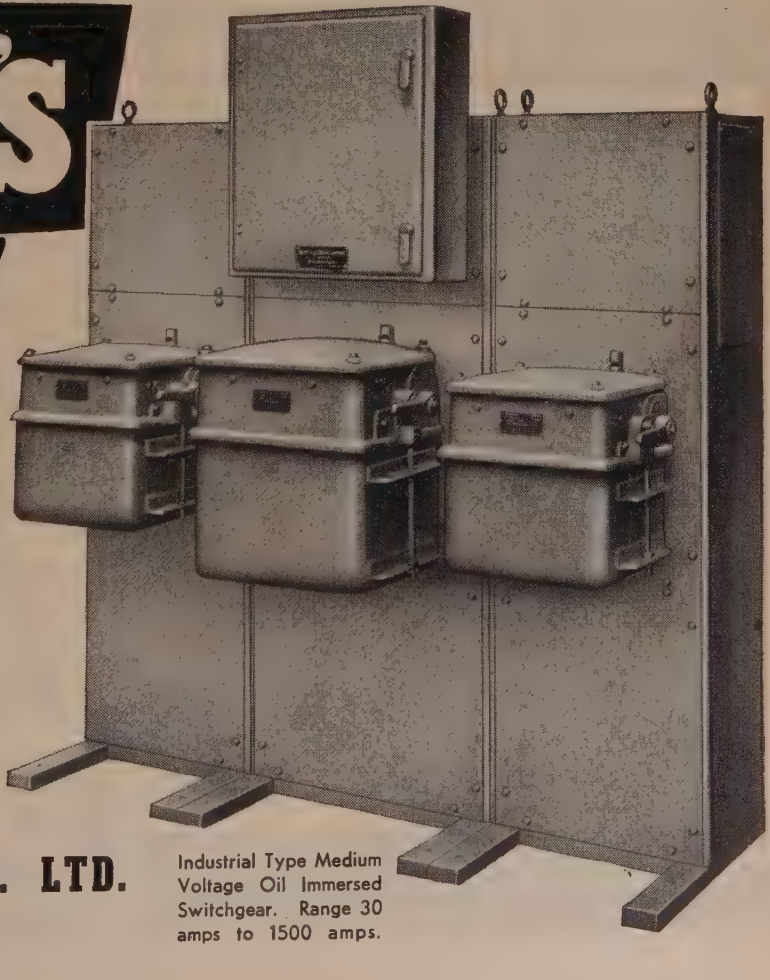

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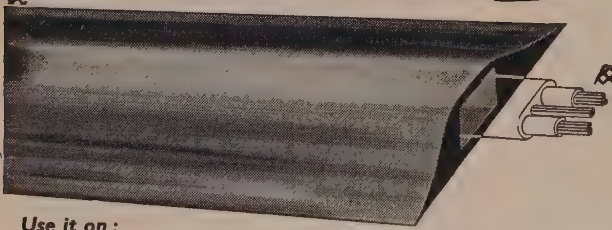

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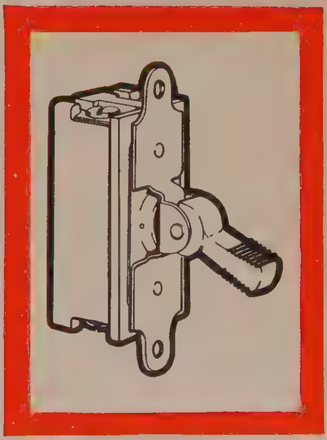

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These flush mounting quick make and break switches are used extensively for domestic appliances and for many industrial purposes.

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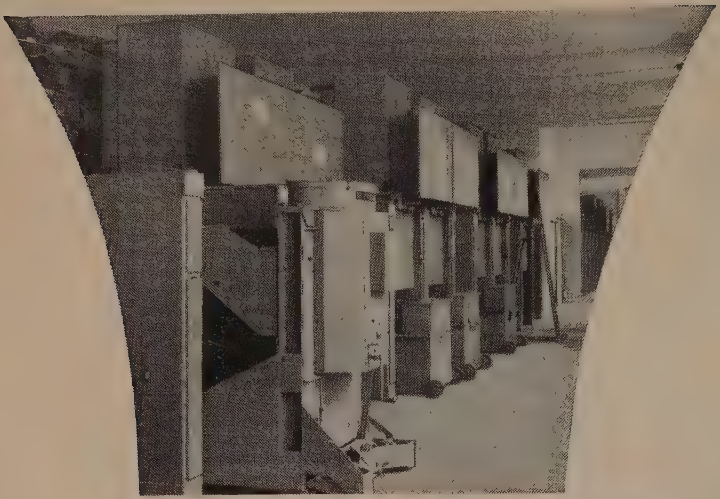

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Messrs. Merz and McLellan

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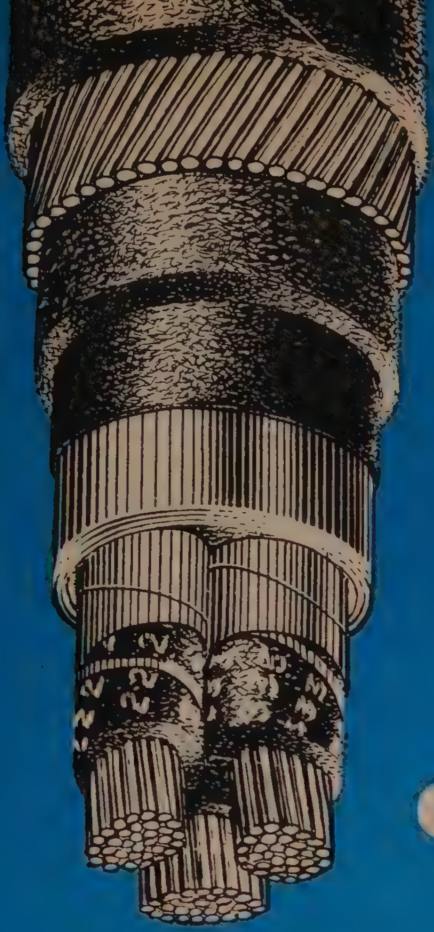

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M-W 1017

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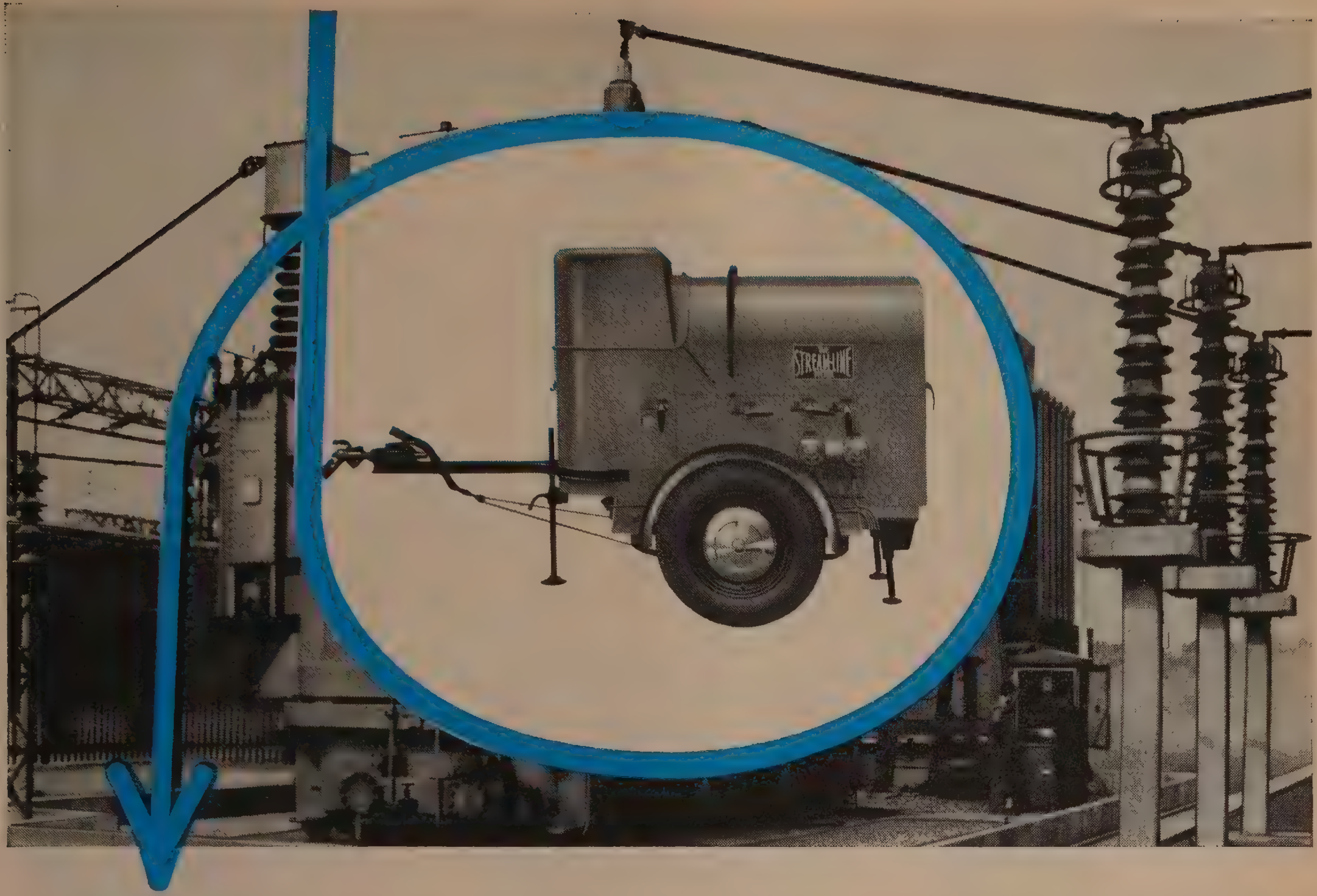
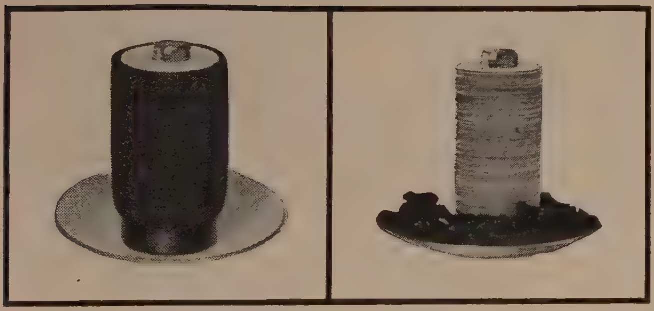


Loop in a Stream-Line filter



These illustrations show the Stream-Line filtering element built up of special paper discs under end pressure. Oil passes through the infinitesimal interstices between the discs leaving solid impurities at the paper edges. Instantaneous cleaning is carried out by a reverse flow of compressed air.

The security of oil-immersed circuit-breakers and transformers depends on the condition of the insulating oil, for if it contains impurities and moisture a serious loss of insulating protection will occur. The Stream-Line filter, embodying filtering elements, heating chamber and vacuum receiver, is the most perfect practical safeguard against this happening. A *single* passage of oil through a Stream-Line filter ensures the elimination of *all* solid impurities including the finest colloidal carbon. In addition, dehydration and de-aeration ensure the removal of all free and dissolved water and gases—*and the filtered oil will have a dielectric strength far above that specified for new oil.*

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The standard Stream-Line filters, working at moderate vacuum, are fully adequate for most requirements but in order to cater for exceptional cases models are also available to operate under high vacuum. Treatment under conditions approaching absolute vacuum, combined with the unique Stream-Line edge-filtration principle, gives results with regard to the elimination of the last traces of air and moisture which are quite remarkable. Send us particulars of *your* special requirements.

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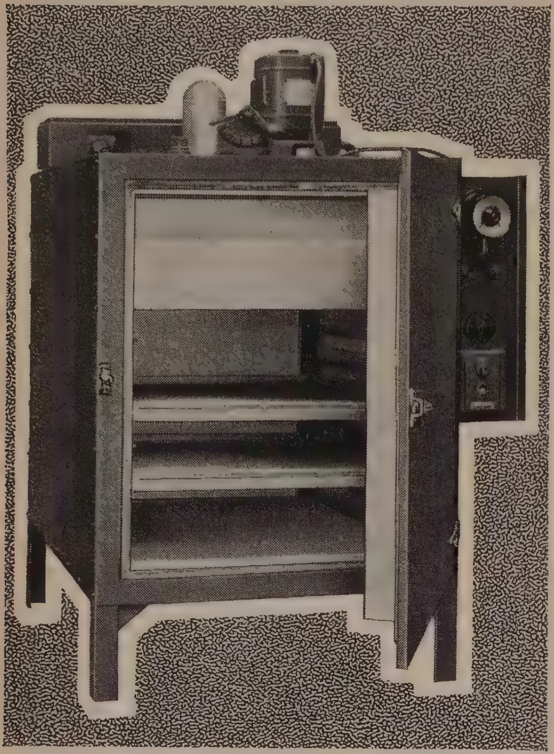
SF103

NEW 'closed circuit' low temperature OVEN

(*Patent Pending*)



cuts DRYING TIME FROM HOURS TO MINUTES

The revolutionary new A.E.W. 'Closed Circuit' Drying Unit saves hours of drying time. It steps up production and saves you money by using low temperatures of 35°C to 40°C. The secret—there is no air exchange to the atmosphere, the same air is re-circulated and all moisture is absorbed by the drying unit. Pre-heating is unnecessary and drying starts the moment you press the switch.

A seven section coil was placed under a tap, soaked with water and stored in a damp cardboard box for 6 hours. It was then placed in the oven and dried for an hour.

Look at this **ACTUAL TEST!**

The astonishing result is shown below. (The figures represent insulation resistance in megohms.)

Winding	T 1	A 1	A 1	A 3	A 3	A 5	A 5	A 1	A 7	A 9	A 9	A 11
Before Drying	250		440		260	60		230		170		
After Drying	55,000		60,000		80,000	60,000		250,000		300,000		

Several hours at a much higher temperature would have been needed to achieve this result with a conventional oven.

Write for brochure giving fullest details.
Demonstrations arranged at our Works.

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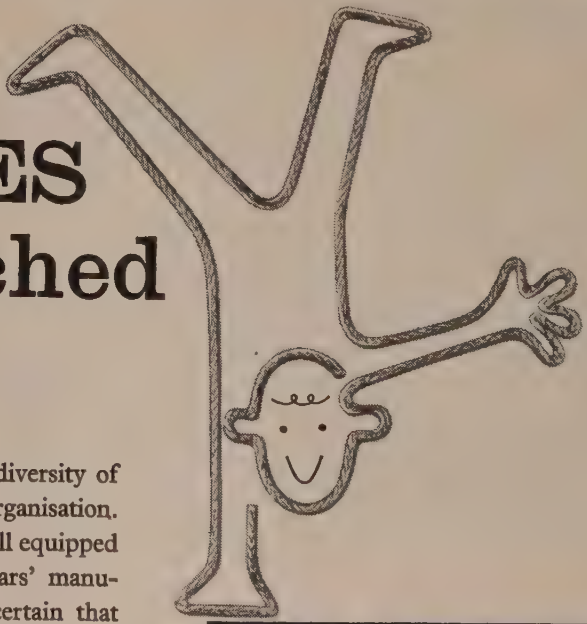

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Low tension electrical porcelain products in a diversity of designs pour out by the million from the Kent organisation. Whatever your requirements may be, we are well equipped to meet all your demands. With over 80 years' manufacturing experience to rely on, you can be certain that a Kent product can be specified with safety.

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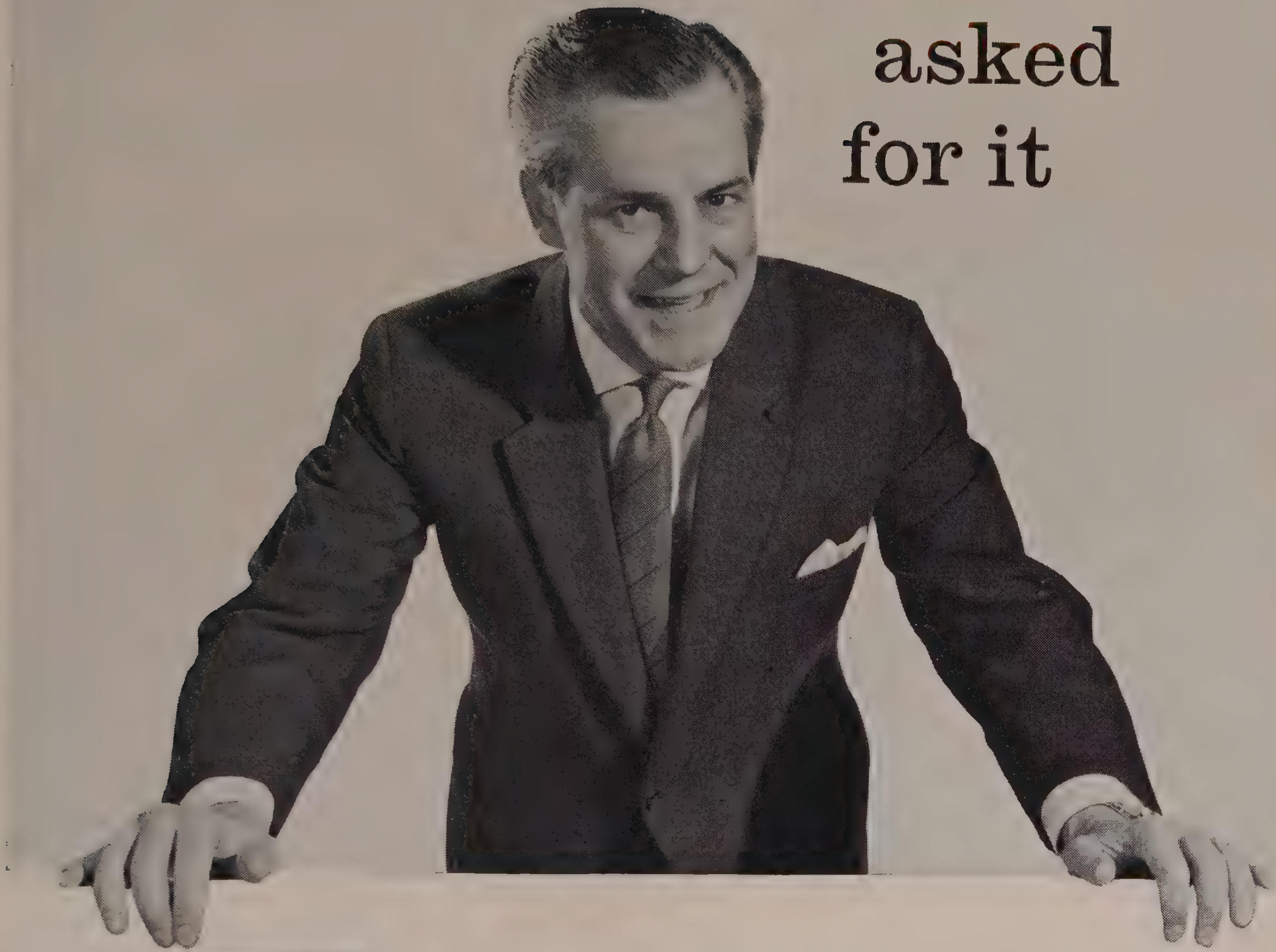

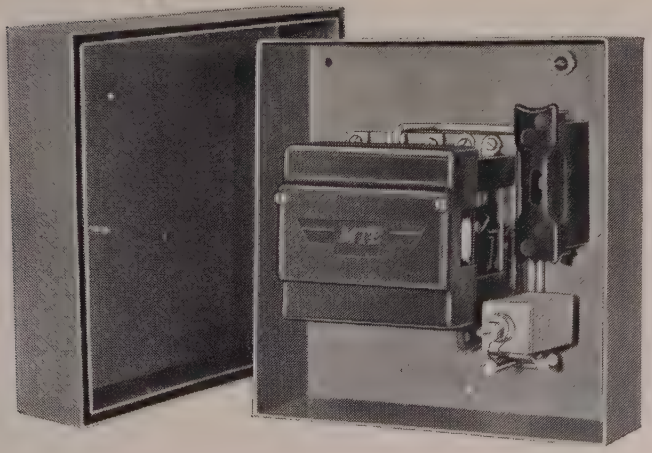

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You want contactors that meet all the requirements of electrical heating circuits and M.T.E. have developed just that. Customer experience, built up over the years, has proved the dependability of M.T.E. contactors – now this special development is being produced to simplify the selection and installation of contactors for heating control.

Covering the range from 15 to 150 amps, M.T.E. Heating Contactors are available in single, double and triple-pole form, all contacts are fully protected by an arc barrier and cover in Alkyd moulding. Compact, heavy duty, unit constructed M.T.E contactors are silent in operation and fully comply with BSS.775 (1956). Front access and front wiring make for easy installation, whilst sheet steel dust and damp protecting enclosures incorporate knock-out conduit entries at top and bottom.

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435 miles of P.V.C. cable, 3½ miles of mains cable have been installed.

These cables are obtainable from G.E.C. Installation Equipment Group or direct from Pirelli-General Cable Works Ltd.

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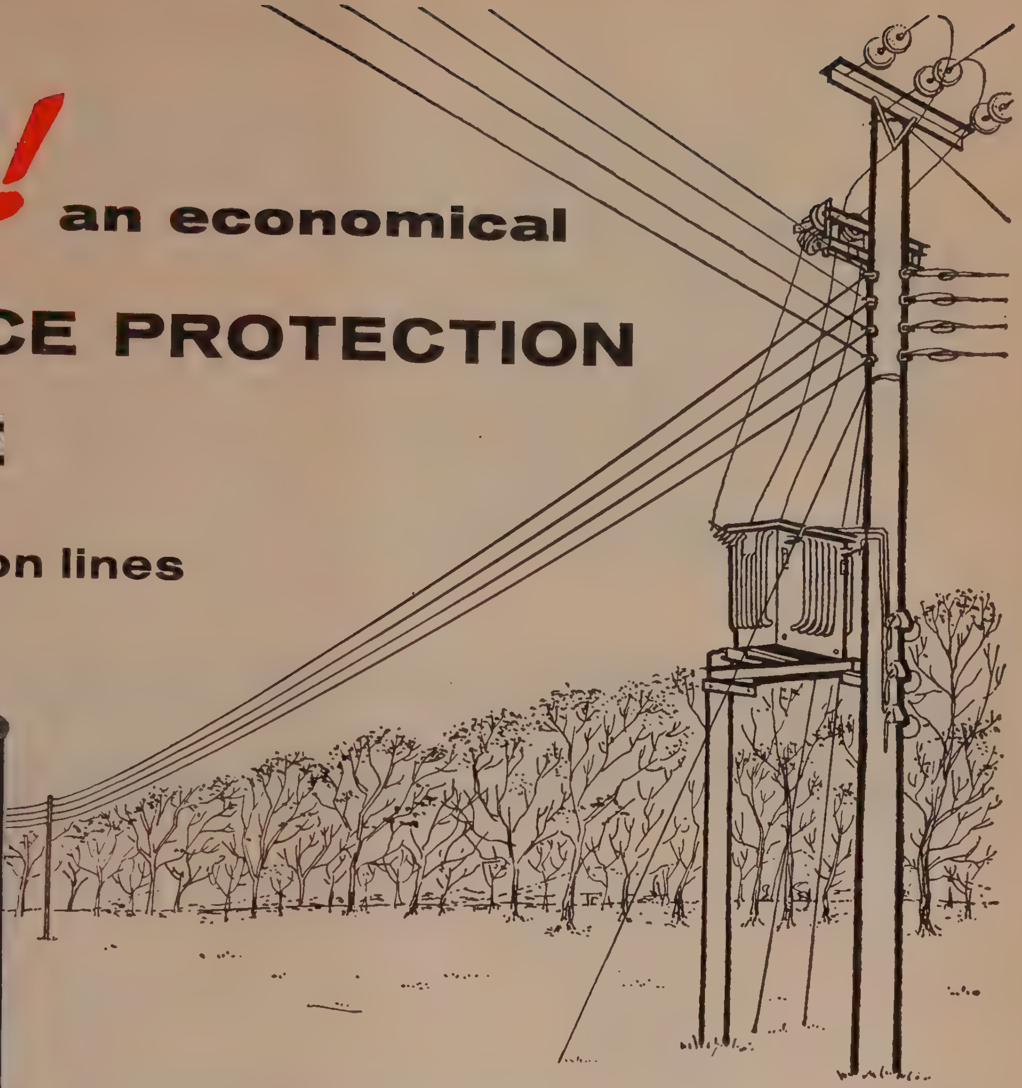
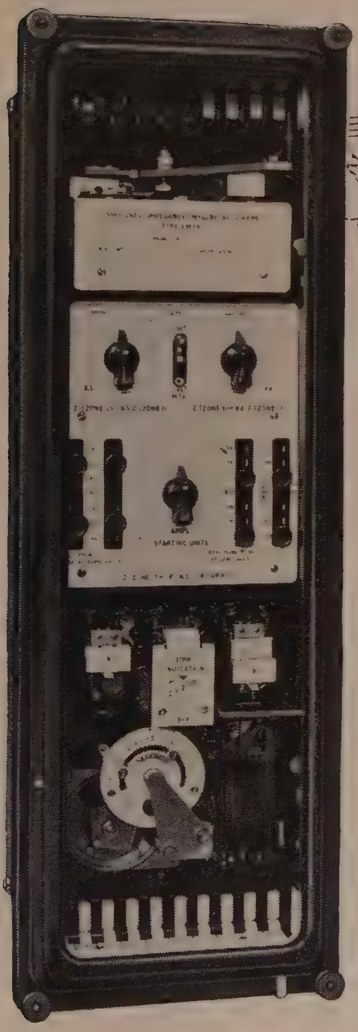
P.6460

Now! an economical

DISTANCE PROTECTION SCHEME

for distribution lines





The 'English Electric' type SSM3V switched 'Mho' distance scheme provides phase fault protection for 11 kV or 33 kV lines at a cost very little more than inverse-time overcurrent relays. It overcomes discrimination problems and is high speed in operation.

Correct zone and phase flagging is always ensured by a simple interlock system which releases the flag mechanism only when the relay trips.

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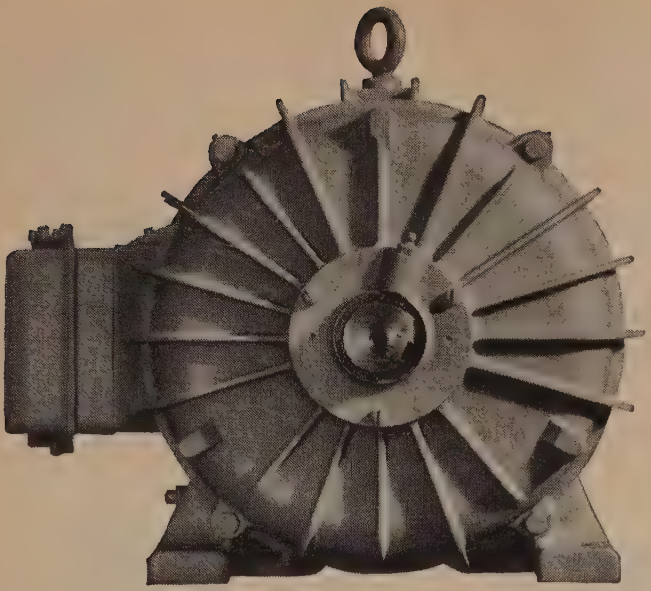
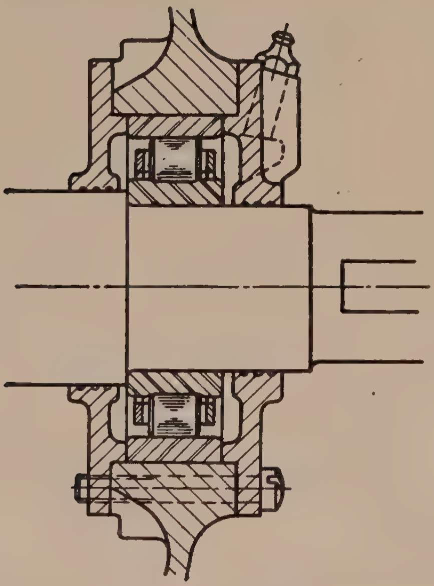


Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on know-how or experience.

This thing called know-how



Take for example bearings. We were amongst the first manufacturers to fit ball and roller bearings to electric motors and, in fact, they were standard equipment on our machines whilst the majority of motors still had sleeve bearings. The ubiquity of ball and roller bearings on motors today indicates how right this early choice was. There is a small but important detail in which the housings of the bearings on our motors differ from those on many others. We bore the end-shield clean through and fit two caps. The through bore allows of more accurate gauging—particularly with regard to parallelism—than a blind hole and the cost of the extra cap is in our opinion more than justified by this and by the better grease retention it makes possible.

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Thermostatic Bimetal by—

B·D·H

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Type 3600. Ideal for appliance thermostats. Maximum sensitivity range 0°F to 600°F. High deflection and good strength properties in the range of maximum sensitivity. Can be used up to 900°F.

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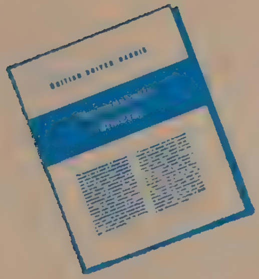
Type 6650. For low temperature thermostats and low ampere circuit breakers. Exceptionally sensitive in the 0°F to 400°F range. Not for use above 400°F, or in corrosive conditions.

Type 6850. High resistivity distinguishes this circuit breaker bimetal. Not recommended for use above 400°F, or where corrosive conditions exist.



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If you want comprehensive details of our versatile range of bimetals, Data Sheet No. 4 is the very thing.

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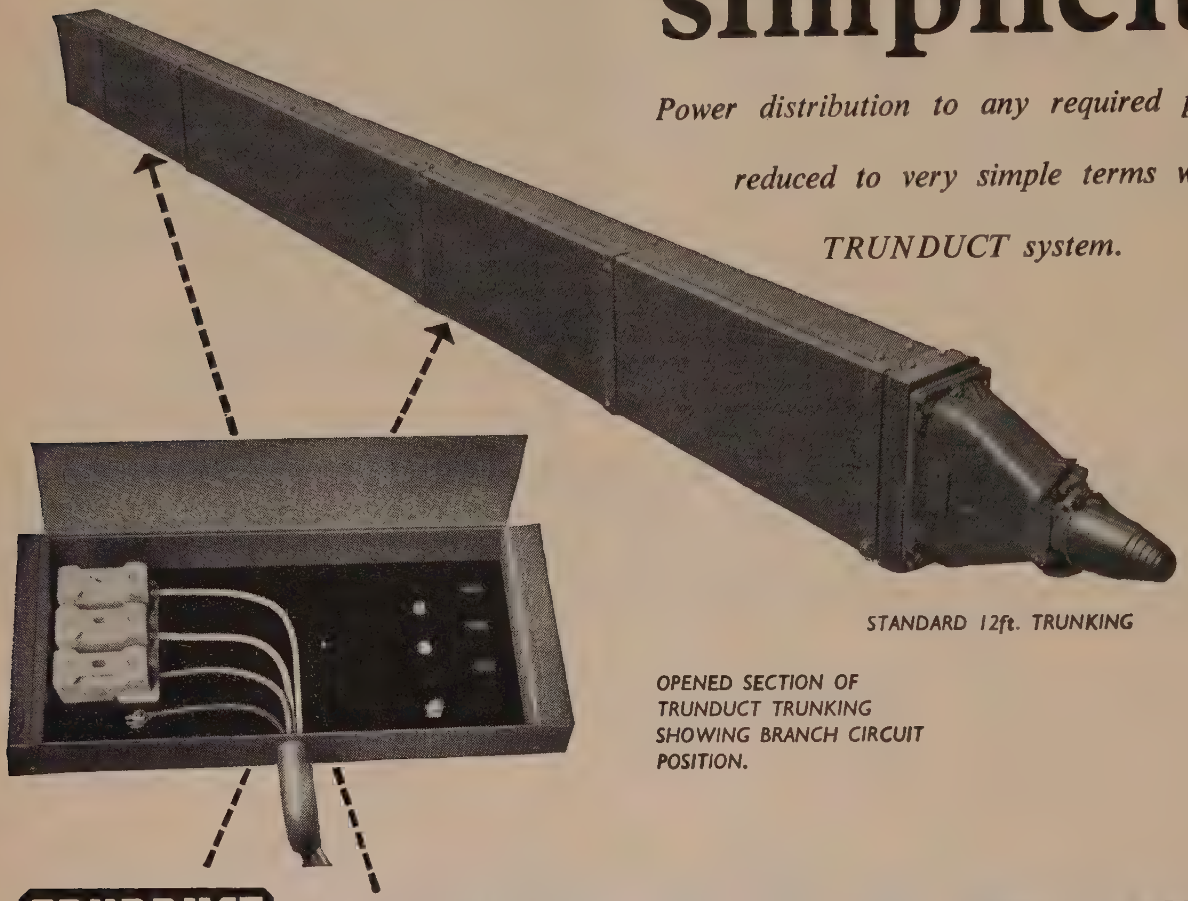
Power distribution to any required point is reduced to very simple terms with the TRUNDUCT system.



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OPENED SECTION OF
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BUSBAR DISTRIBUTION SYSTEM

Write now for a fully illustrated folder giving details of main power distribution 200-600 amps, small power distribution up to 125 amps and rising main distribution.

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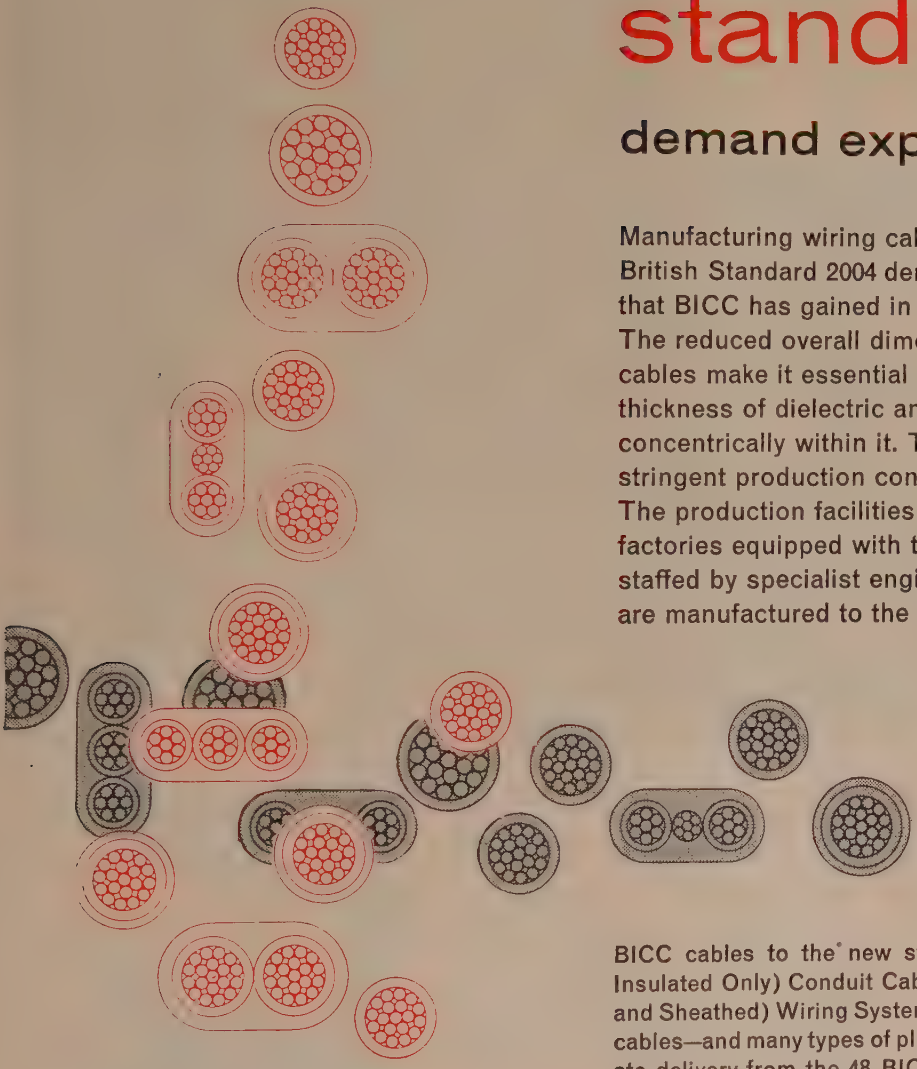
New Cable standards

demand experience



Manufacturing wiring cables to the revised British Standard 2004 demands the kind of experience that BICC has gained in over sixty years of cablemaking. The reduced overall dimensions of the new type cables make it essential to maintain the correct thickness of dielectric and to place the conductors concentrically within it. This means employing the most stringent production control techniques.

The production facilities of BICC—a group of factories equipped with the most up-to-date plant, staffed by specialist engineers—ensure that the cables are manufactured to the highest attainable quality.

BICC cables to the new standard include 'X' types (P.V.C. Insulated Only) Conduit Cables and 'Y' types (P.V.C. Insulated and Sheathed) Wiring System Cables and Flexible Cords. These cables—and many types of plastic cable—are available for immediate delivery from the 48 BICC Branches throughout the British Isles. For further details of cables to B.S. 2004: 1961, write for Publication 439.

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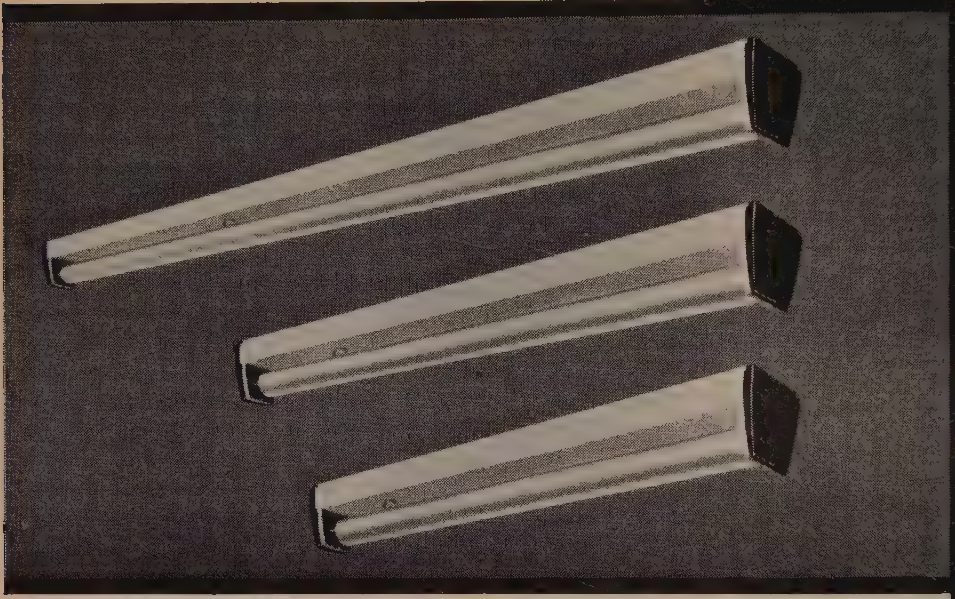

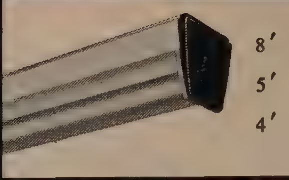

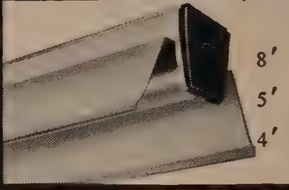

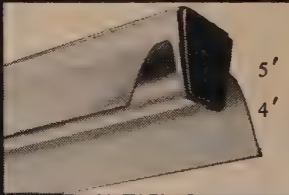

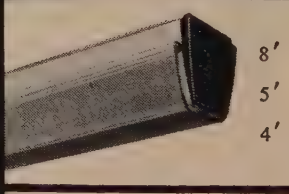

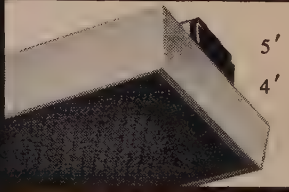

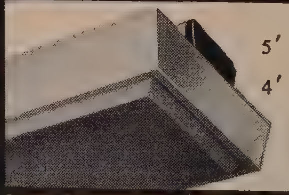

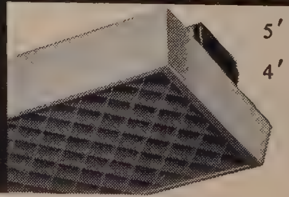

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Are packed complete with high-output Crompton Warm White tubes and are fitted with full-size efficient control gear to B.S.2818.

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Include reflectors of metal and colour-fast 'Diakon'—'Diakon' diffusers—scintillating glass panels—opal plastic dishes—plastic louvres, all of which are simply attachable to the Crompack.

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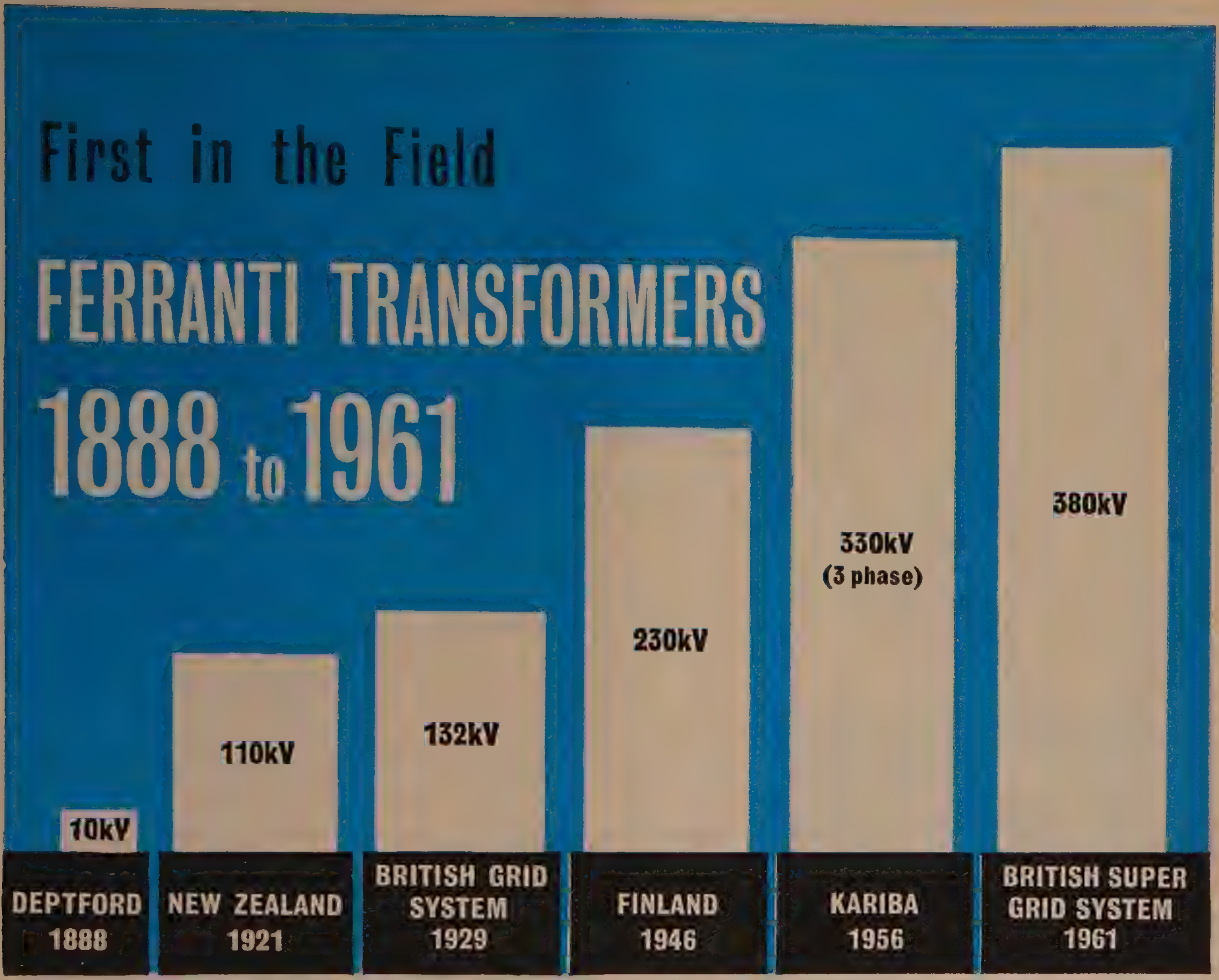

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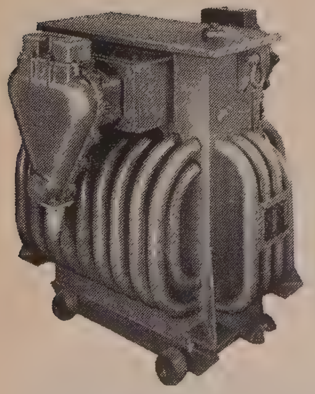

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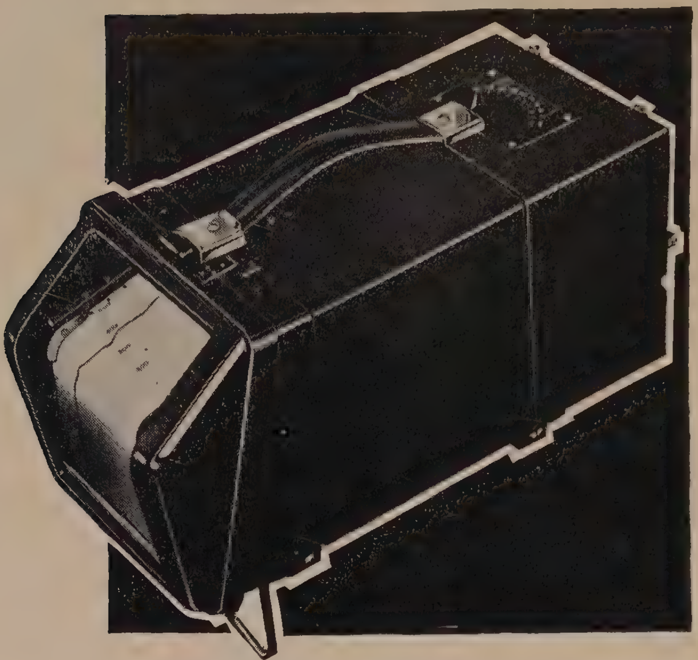
Everett Edgcumbe Recorders keep continuous silent watch



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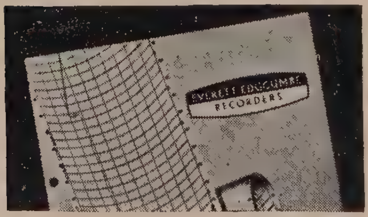

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ELECTRICAL REVIEW

28 April 1961 Vol. 168 No. 17 Established 1872

Dangers of Isolation

INDUSTRY and commerce cannot wait indefinitely for a united Europe. They must adjust their policies to the situation as they find it. One result is that investment is being duplicated on an increasing scale to overcome the effect of rising barriers to trade between the European Free Trade Association and the Common Market. This, as Sir William McFadzean pointed out in his presidential address to the Federation of British Industries, must be taking place " to the detriment of more essential investment in other parts of this capital-starved world." He believes that the most valuable contribution that industry and commerce can make to a final settlement is to strive to keep business flowing at a maximum level between all countries.

After a slow start British electrical manufacturers have been becoming increasingly alive to the opportunities for selling to the highly industrialised countries on the Continent. Much damage has been done by regarding the relationship between this country, the Commonwealth and Europe as one of alternatives, but it is significant that last year the most dynamic section of the electrical industry, that covering radio and electronic apparatus and components, sold more to Europe than to the Commonwealth. Europe has also been the fastest growing market for domestic appliances and last year sales of washing machines to Continental countries were three times higher than those to the Commonwealth. Plant for electricity supply concerns, whether privately or publicly owned, presents special problems, but there should be scope for expanding sales of industrial equipment. The teams that have been visiting the Continent under the ægis of the Export Council for Europe will no doubt point the way to future development. Having progressed so far it would be unfortunate if the immediate difficulties presented by the division of Europe should lead to a slackening of effort.

For the electrical industry, price, standards and design are more likely to prove limiting factors than tariffs. This is where the other side of the shield of greater trade may exert a beneficial influence. The high degree of protection which British electrical manufacturers have enjoyed for many years has tended to isolate both them and their home customers from the trend and stimulus of technical development abroad. This was of small importance so long as the Commonwealth with its strong British engineering traditions was the main market, but with the greater penetration of European methods and standards it can no longer be ignored. In the meantime the industry's principal competitors are gaining added strength in a variety of ways from their closer association within the Common Market. Here lies the main danger of isolation.

In the past Great Britain has made the mistake of viewing the integration of Europe too exclusively as an economic problem. There are now growing signs that the need for a primary political decision is realised. But Sir William McFadzean issued a timely warning that any attempt, welcome though this would be, to find a solution to outstanding political difficulties, and particularly those of Anglo-French relations, should not be at the expense of vital industrial interests.

THE B.E.A.M.A. COUNCIL

The standing of B.E.A.M.A. in its dealings with other bodies and Government Departments will be enhanced by the reorganisation of its Council, now completed. The combination of the offices of president and chairman gives greater authority to the elected head of the Association. By retaining the services of former presidents and chairmen, as counsellors, the Council will continue to benefit from the advice of men with unrivalled experience in the electrical industry. Further strengthening of the Council, and a broadening of its outlook, has been obtained by the co-option of several people prominent in the industry who have not previously been Council members (see page 765).

When domestic appliances are discussed, the chairman of the Domestic Appliances Division attends the Council meeting, and closer liaison with other B.E.A.M.A. activities is being secured by regular meetings between the president and section chairmen. Naturally, most is heard of B.E.A.M.A. when it assumes the role of spokesman for the industry. This is a valuable function because electrical manufacturers have a large common interest. Yet it should not be allowed to overshadow the more humdrum but no less important day-to-day services which the Association renders to its members. In both directions the new Council will find much to occupy its time.

ASSESSING REPLACEMENT COST

The requirement specified in the Government White Paper (Cmnd. 1337), reviewed in our last issue, that in future the nationalised industries must provide for depreciation on a replacement cost basis has set the managers of these industries a nice little problem, namely how replacement cost is to be estimated. Depreciation provision is a sequence of annual accounting and financial transactions which is initiated when the plant is installed and terminates some 25 to 40 years later. How can anyone possibly foretell at the commencement of this process what will be the replacement cost at the end of it?

The assumption that the replacement cost per kilowatt of identical plant will be greater than the historic cost is based on past experience. The effect is due broadly to inflation, and if this is to continue during the lifetime of the plant now being installed such an assumption appears to be reasonable. But with electrical plant there may be countering factors such as improvements in manufacturing practice. Above all there is the over-riding factor that plant is very rarely replaced by identical plant. Frequently it is in bigger units, it may employ a technically higher process, and it may have greater efficiency. It might be possible to generalise very broadly and say that generating plant is usually not replaced by anything like the same sort and size of plant whereas distribution plant frequently is.

In short, the Boards are required to change from a system of depreciation provision that is factual to one that is hypothetical. A possible solution would be to work out the provision necessary to cover historic cost and then to increase this in some ratio based on past experience of how much the prices of such plant have risen in previous life periods. The ratio would doubtless be different for generation and for distribution plant, and might even have to be different, say for transformers and for cables.

END-WINDING FIELDS

The two papers presented at a meeting of the Supply Section of the Institution of Electrical Engineers on 12th April (see last week's issue, page 723) are certain to be of considerable interest and value to designers of large rotating machines, and will probably provoke as much discussion throughout the industry as occurred at the meeting itself. These papers deal with the magnetic fields which are present at the end windings of rotating machines, particularly turbo-generators. Knowledge on this subject has been somewhat sparse, although the higher current loadings resulting from increasing the output from individual machines which are limited in physical size by mechanical considerations have produced greater stray losses, which might cause local hotspots, and inter-winding forces.

The study of the fields at the machine extremities, although long overdue, is difficult because of the complex winding structure at this point, and it is only recently that computers have enabled such work to be of practical value. The papers investigate some of the basic features of the problem, such as end plate permeability, by two methods, differing primarily in the way in which the currents in the windings are represented. No attempt has been made to calculate the magnitude of the stray losses, but we hope that the work can be extended to cover this as it would undoubtedly be an invaluable contribution to the science of turbo-generator design.

Domestic Supplement — Refrigerators — at the end of this issue

HIGH ENERGY PLASMA

APPLICATIONS IN D.C. CIRCUIT BREAKING

By J. J. MATTHEWS, M.A.*

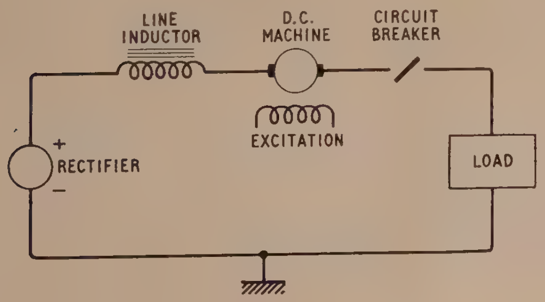
Knowledge of plasma physics has been enriched in the past ten years by world-wide research efforts to achieve controlled thermo-nuclear reaction. The object of the author's Research Fellowship is to exploit the control of high energy plasmas in electrical engineering applications. This article, based on a paper presented at the last A.E.I. summer school for professors of electrical engineering, deals only with a particular example, a d.c. generator with an arc discharge in place of its armature, which has theoretical possibilities as a high voltage d.c. circuit-breaker

THE demand for a high voltage d.c. circuit-breaker stems from the advantages which d.c. electric power transmission has over a.c. where long distance overhead lines or cables under the sea are concerned. These include the absence of line-charging current, kVAr and reduced losses. An asynchronous system is essential for a connection between two separate a.c. systems, e.g. the proposed cross-Channel link between England and France. Experimental d.c. lines now in operation in Russia and Sweden rely for their protection upon switchgear in the a.c. circuits of the a.c./d.c. convertor stations. More ambitious schemes will depend upon the development of suitable d.c. switchgear. In these d.c. transmission circuits, a high value of line inductance is introduced to smooth out convertor ripple and to limit the rate of rise of fault currents. It is generally agreed that conventional circuit-breaker designs cannot be relied upon to suppress high voltage d.c. The necessary current suppression would in any case give rise to current chopping, which cannot be tolerated in an inductive circuit.

A known solution to this problem is to connect a capacitor in shunt with the circuit-breaker to control the restriking voltage after the current has been chopped. With a little ingenuity, this capacitor can also be used to force a current reversal in the circuit-breaker itself, so that it can open at current zero, following normal a.c. practice.

A direct current may also be reversed by a d.c. machine, and a suitable circuit is shown in Fig. 1. If the machine is provided with a mechanical drive or a suitably programmed excitation, the duties of the circuit-breaker can be reduced virtually to those of an isolator. In the simplest case, the machine would be provided with a fixed excitation and its own flywheel inertia as load. Under these conditions it behaves essentially as a Kapp vibrator (i.e. as a capacitor) and gives rise to sustained sinusoidal current oscillations. An a.c. circuit-breaker can therefore clear the circuit at the first current zero.

Fig. 1.—Circuit arrangement for current reversal using a d.c. machine



It is naturally not possible to make a conventional d.c. machine for this high voltage duty. At the 1958 "Atoms for Peace" conference at Geneva, however, a device was described by W. R. Baker of Berkeley, California, in which plasma is caused to rotate in a magnetic field as the armature of a homopolar d.c. machine. Such a device behaves as a Kapp vibrator, for a period of time which is limited mainly by the arc stability. In Baker's original machine, this time was only 100 μsec, but more recent work with rotating plasmas has achieved stability for up to 1 msec, which is already sufficient for the device to be of interest as a circuit-breaker.

Homopolar I

A diagram of Baker's first rotating plasma machine, Homopolar I, is shown in Fig. 2. It resembles a Faraday disc in which the disc has been replaced by a plasma sheet between concentric electrodes. The plasma is a part of the arc formed when the circuit current breaks down a low pressure gas between the electrodes. The current flow traverses the axial magnetic field and sets the plasma into rotation. The effectiveness of a rotating plasma as a Kapp vibrator depends upon the amount of kinetic energy stored in it. In Homopolar I, kinetic energy densities of up to 4 joules/c.c. were observed. This compares with about 20 joules/c.c. stored in a cast iron flywheel and $\frac{1}{20}$ joule/c.c. stored electrically in a paper dielectric capacitor. Voltage gradients of the order of 1 kV/cm were generated in the plasma armature, so that rotating plasmas should be very suitable for high voltage

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* A.E.I. (Rugby), Ltd.

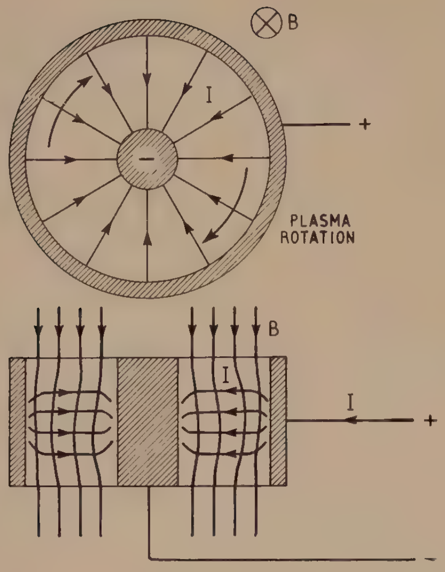


Fig. 2.—Diagrammatic arrangement of the first rotating plasma machine, W. R. Baker's Homopolar I

applications. The critical feature is the short energy-storage lifetime.

There are several energy loss mechanisms, and to devise methods of controlling them the plasma motion must be studied in more detail. For this purpose, plasma may either be considered as a conducting fluid, or as a set of charged particles whose orbits are modified by collisions.

Magneto-hydrodynamic Approach

First, consider the plasma as a compressible, electrically conducting fluid which has been set into rotation by I × B motor forces. It would be compressed against the outer electrode by the resulting centrifugal force, if it were not for an induction drag as the conducting plasma fluid moves in the magnetic field. To evaluate this effect, let us consider the equilibrium of a thin cylinder of plasma of radius r, thickness dr, and unit height, concentric with the electrodes (Fig. 3). Under equilibrium conditions the radial current will have fallen to negligible proportions.

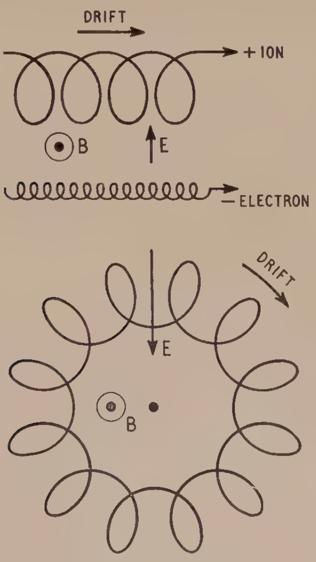


Fig. 4.—Movement of ions and electrons in crossed magnetic and electric fields

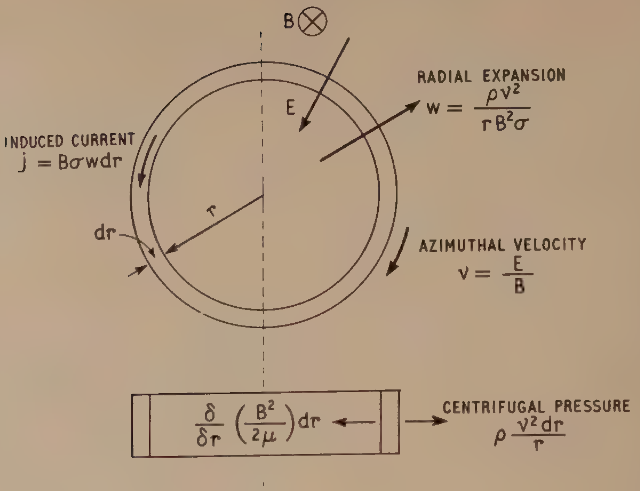


Fig. 3.—Equilibrium of fluid ring in an axial magnetic field

There is therefore no radial electric field relative to the moving plasma. Transforming to fixed axes, the measured radial field E is v × B. Conversely, the velocity required to generate a field E is E/B, the ratio of electric to magnetic fields. For high voltage applications, high radial fields are desirable, in turn implying high rotational velocities. To obtain the previously mentioned electric field of 1 kV/cm with a magnetic field of 10 kgauss, v is required to be 10^7 cm/sec. Such a high velocity can be achieved only in a low density plasma fluid.

The radial expansion velocity w causes the generation of an e.m.f. round the ring. A circulating current J therefore flows, equal to $B\sigma wdr$ where σ is the electrical conductivity. The induction drag just balances the centrifugal pressure $\rho\frac{v^2}{r}dr$ where ρ is the mass density. Equating the power dissipated by the eddy current J in the ring to the work done by the centrifugal pressure in expanding gives the expansion velocity $w = \rho v^2/rB^2\sigma$. Clearly this can be reduced indefinitely by choosing a plasma of sufficiently high electrical conductivity. It has been shown that plasma conductivity is a function only of temperature T and the degree of ionisation Z and $\sigma \propto T^{3/2}/Z$ so that high conductivity in turn implies high temperatures.

A high value of magnetic field is also desirable to reduce the expansion rate. The inverse proportionality of w with radius indicates that the expansion is less important with larger machines. The real significance of this is made clear by defining a time τ_w as the ratio of some characteristic length of the machine to the expansion velocity. If this characteristic length = r then $\tau_w = B^2r^2\sigma/\rho v^2$. τ_w is a characteristic time of the containment of plasma away from the machine walls, and it represents one upper limit to the possible energy-storage lifetime. Because $\tau_w \propto r^2$ large devices have inherently longer storage times.

The eddy current J causes field-weakening inside the plasma ring. A theoretical limit to the stored energy density is that value which causes complete cancellation of the magnetic field at the central electrode. The radial magnetic field gradient can be calculated from the Maxwell equation: curl H = current density. (Neglect-

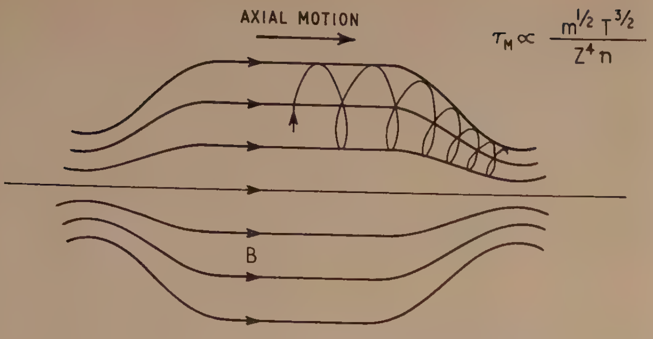


Fig. 5.—Ion movement in a non-uniform magnetic field

ing displacement currents as usual in a conductor.) The result is most conveniently expressed as

$$\frac{\delta}{\delta r}\left(\frac{B^2}{2\mu}\right)=\rho\frac{v^2}{r}$$

i.e. the centrifugal pressure is balanced by a change of magnetic field energy density across the ring. It is therefore useful to think of the magnetic field in terms of its Maxwell stresses: a transverse pressure $B^2/2\mu$ together with an equal tension along lines of force. Their effect can be seen by referring back to the diagram of Homopolar I. In the region of radial current flow, the magnetic lines of force are stretched outwards by the centrifugal pressure from the plasma. The curvature of the field can have an important effect in delaying plasma axial motion and therefore in minimising the loss to the insulators.

Particle Orbit Model

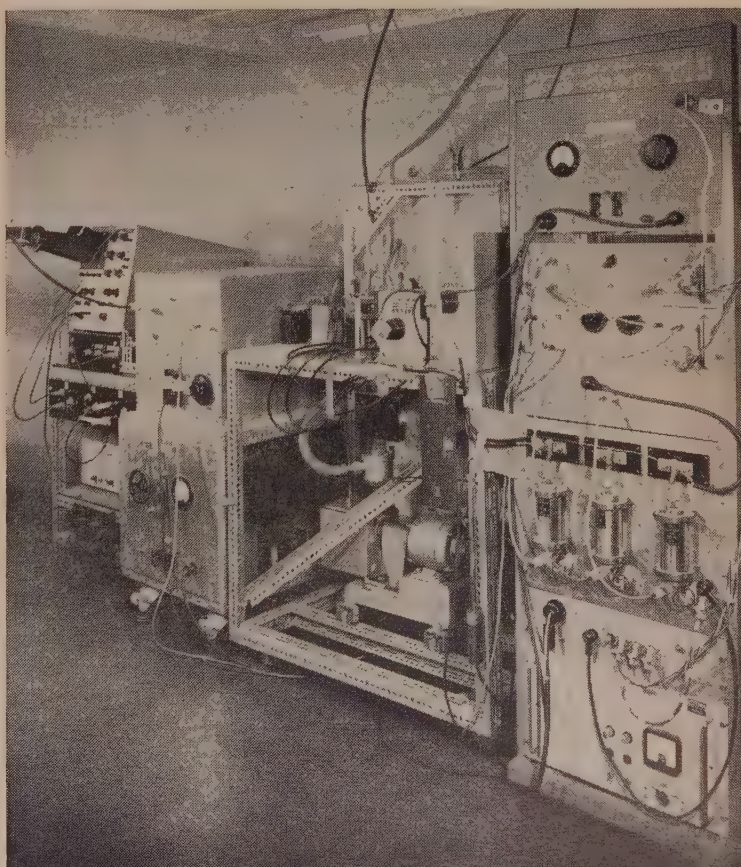
The normal motion of a charged particle in a magnetic field is helical—a combination of a circular or cyclotron orbit perpendicular to the field, and a uniform motion parallel to it. If the time taken by a particle to complete an orbit is small compared with the average time between particle collisions in a volume of plasma, a consideration of individual particle motions will give a guide to the overall volume behaviour. This condition is fulfilled by low plasma densities and high plasma temperatures in strong magnetic fields. The upper diagrams in Fig. 4 show the motions of ions and electrons with an electric field superimposed at right-angles to the magnetic field. For simplicity, motions parallel to the magnetic field have not been considered. With a magnetic field outwards, the normal ion cyclotron motion is clockwise. The electric field shown causes acceleration of the particle as it moves upwards, and deceleration downwards. The resulting cyclic changes in radius of curvature give rise to an overall drift of the ion orbit to the right. For the electron, the cyclotron motion and the forces due to the electric field are both reversed, giving rise to a drift again to the right. The drift velocity works out to be $\frac{E}{B}$ independent of the nature of the particle considered. In the present application, energy storage is of prime importance: energy is stored by individual ions in proportion to their masses. Electrons, being 3 or 4 orders of magnitude lighter, store negligible energy. If the electric field is replaced by a gravitational field, similar drifts arise, but, because gravitational forces are independent of charge, the electron drift velocity is now reversed in direction.

In the rotating plasma machine there is an axial magnetic field, and radially, both electric and centrifugal gravitational fields act together. The resulting ion orbit is shown in the lower diagram of Fig. 4. The electric field causes both ion and electron orbits to drift azimuthally in the same direction. The superimposed gravitational forces cause a small decrease in the ion orbit drift velocity, and have negligible effect in the electrons because of their small mass. The difference between the drift velocities of the ions and the electrons causes a circulating current to flow, which corresponds exactly with the currents calculated for the fluid case. The neglect of particle collisions corresponds to the assumption of a superconducting fluid. A calculation of the field-weakening effect has been made by Longmire and this gives the same field pattern as that deduced for the fluid model.

It remains to show how the axial motion of plasma is constrained by the curvature of field lines. Consider the motion of an ion in the magnetic field configuration shown in Fig. 5. In the uniform field region, it orbits round one particular field line while travelling with constant axial velocity. As it enters a region of increased field, by the conservation of angular momentum and energy, its orbital energy increases at the expense of its axial velocity. If its ratio of axial to azimuthal velocity is high it will pass the region of maximum field and be lost. But for a low ratio, the particle will be stopped and reflected back. The particle is then said to be confined in a magnetic bottle between magnetic mirrors. The effect of superimposed plasma rotation is to increase the proportion of particles which are confined, because now, as the particle moves towards the axis in the mirror field, its axial energy must also supply the work done against the radial centrifugal forces.

In general, particles will continually be lost through the mirrors because collisions inside the bottle will tend to maintain particle velocities in a Maxwellian distribution.

An early rotating plasma experimental equipment in the Research Laboratory of A.E.I. (Rugby), Ltd.



At low densities, particles able to escape from the bottle will normally do so without further collisions.

Energy Loss Processes

The energy loss processes may now be analysed in more detail. It is convenient to refer to a loss process by its time constant τ of energy decay. The most significant time constant is obviously the shortest one. The losses may normally be analysed by the fluid model from a knowledge of the bulk viscous and thermal properties of the plasma. At particle densities lower than about 10^{13}/c.c., when the gas kinetic mean free path becomes equal to a characteristic machine dimension, normal thermal and velocity gradients are not set up. The energy loss may then be identified with the particle flux to the walls.

The chief energy losses are by friction against the outer electrode (radial particle losses); by friction against the end insulators (axial particle losses); by charge-exchange; and by electromagnetic radiation. A time constant has already been derived for radial losses as an example using the fluid model. It is not usually the significant loss, but it does illustrate the general trend of energy lifetimes: $\tau \propto T^{3/2}/n$ where n is the particle density.

In the fluid model, the end loss may be identified with windage friction at the end insulators. It may be measured electrically as the conventional no-load loss of the machine. In Homopolar I, the end loss is the significant loss. Baker has eliminated it in a new version, Homopolar III (Fig. 6), in which the electrodes are bent to bring the insulators parallel to the axis. As the plasma accelerates, it is dragged away from the insulators by centrifugal forces. Preliminary results show that end friction is no longer significant.

In general, energy storage lifetimes are inversely proportional to plasma density. In " Ixion," the rotating plasma device for which the longest lifetimes have so far been reported, plasma densities are two orders of magnitude less than in " Homopolar." Magnetic mirrors are used to isolate the ends of the " Ixion " plasma from the insulators, but even so, the loss rate through the mirrors is still the significant loss. The associated time constant is the time for the particle confined between the mirrors to achieve a Maxwellian velocity distribution, $\tau_m = \frac{m^{\frac{1}{2}}T^{3/2}}{Z^4 n}$. Note the usual dependence on $T^{3/2}/n$. The $(\text{mass})^{\frac{1}{2}}$ term implies that electron losses will be more rapid than ion losses, but this results in a space charge electric field across the magnetic mirrors which inhibits further electron losses without promoting an increase in ion losses.

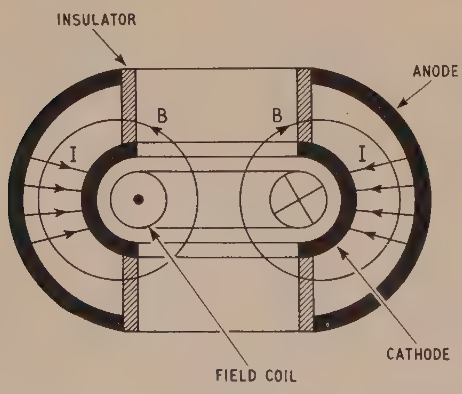


Fig. 6.—In the more recent rotating plasma machine, Homopolar III, the electrodes are curved to bring the insulators parallel to the axis

The inverse fourth power dependency on the degree of ionisation of the ions, Z, is rather serious, because most materials are readily raised to multiply-ionised states at high temperatures. Therefore only hydrogen (which is not multiply-ionised) and perhaps sodium and lithium (which have high second ionisation potentials) can be contained significantly by magnetic mirrors. Impurities from the insulators and electrodes therefore carry away a disproportionately large energy flux. Since this gives rise to wall erosion, the process may be cumulative. Suitable refractories must be chosen for both electrodes and insulators to maintain the purity of the gas filling.

The phenomenon of " charge-exchange " occurs between plasma ions and neutral gas atoms. In a highly ionised plasma, there is a high probability of an ion being neutralised by collecting an electron from a neutral particle. The neutralised ion retains its original kinetic energy, and travels out of the discharge unaffected by magnetic containment, leaving a slow ion in its place. The neutral particle density must therefore be kept low, further emphasising vacuum cleanliness.

Electromagnetic radiation consists of Bremsstrahlung or " white " noise resulting from coulomb encounters, and line radiation from the spontaneous de-excitation of atomic states. Bremsstrahlung radiation cannot be prevented, but its intensity is fortunately low. Line radiation represents a serious loss at high temperatures, but it may be avoided altogether by using hydrogen which is not excited above its ionised state.

Instabilities

The lifetime of the rotating plasma is further limited by instabilities which occur in the equilibrium between plasma and magnetic fields. The most important instability probably is the " interchange instability," a process whereby a kink in a magnetic field line grows cumulatively by electromagnetic coupling with plasma inertia forces. If this happens in the rotating plasma, the concentric circles of plasma motion are distorted, and the mechanism for radial containment by circular eddy currents is destroyed. Finally, the plasma condenses into arc filaments like the spokes of a wheel. This process has been analysed by Rosenbluth and Longmire who have predicted a growth rate for it proportional to $\sqrt{g\lambda}$ where g is the centrifugal force and λ is the wavelength of the kink in the plasma. For an elliptical instability, $\lambda \propto r$ and since $\sqrt{gr} = v = E/B$ the growth rate is proportional to the electric field in the machine for a given magnetic field. A further time constant may be defined $\tau_1 \propto \frac{r}{v} \propto \frac{rB}{E}$ after which the plasma will be expected to have broken up by instabilities. The process of design of rotating plasma machines consists in optimising each of the values of τ described in turn. A small homopolar device is at present under construction to test whether or not it can be used successfully to break an elementary d.c. circuit. If this shows promise, the work will be expanded to determine the constants of proportionality for the various loss time constants, and to verify the scaling laws.

Authors' summaries of three papers which were presented to the Utilisation Section of the Institution of Electrical Engineers on 20th April at a joint meeting with the London Graduate and Student Section

ALUMINIUM in Electrical Engineering

By P. J. H. RATA*

For electrical applications, electrical purity or high commercial purity aluminium is normally the first choice, but where mechanical strength is also required, a magnesium-silicon alloy is available with a good combination of electrical and mechanical properties. These various properties, and the costs of the two types of material relative to copper, are given in the table. The oldest and best established electrical use for aluminium, and one for which the material is ideally suited, is for overhead transmission lines. Steel-cored aluminium conductor cables are used almost universally throughout the world for power transmission. Joints and terminations are made by well-established compression techniques. Following the development of the magnesium-silicon-aluminium alloy, increasing use is now being made of all-aluminium stranded cables for rural and urban overhead distribution lines.

Doubts about jointing aluminium have in the past hampered the development of aluminium-cored cables. However, satisfactory techniques have been developed and are now widely employed for the soldering of aluminium conductors, and these cables can enable considerable savings to be achieved. During the past three years considerable attention has been given to the development of plastic-insulated solid core cables. Designs have been produced for three-core cables, with a concentric neutral of aluminium strands for use on p.m.e. systems. The results obtained have been so encouraging that a very good future can be expected for this type of cable with solid conductors, of which two-core and four-core designs have also been developed. The range extends from conductors with a nominal area of 0·04 sq in up to 0·5 sq in cross-sectional area, corresponding to current-carrying capacities of roughly 100 to 400 A. Aluminium is also used in many other types of cable, including stranded flexible cables for aircraft wiring and welding cables, where lightness is particularly important.

	Aluminium	Aluminium Alloy	Copper
Resistivity at 20°C microhm cm ...	2·87	3·13	1·72
Density lb/cu. in.	0·098	0·098	0·32
1. Conductors of same cross section:			
Current carrying capacity ...	78	75	100
Weight	31	31	100
Cost	30	38	100
2. Conductors of same current carrying capacity:			
Cross-sectional area	130	135	100
Weight	40	42	100
Cost	39	51	100
3. Conductors of same resistance:			
Cross-sectional area	165	180	100
Current carrying capacity ...	130	135	100
Weight	51	56	100
Cost	50	70	100

Figures are approximate, costs are based on copper at £230/ton and aluminium at £186/ton.

The properties of aluminium make it an attractive material for cable sheathing. The saving in weight in comparison with lead is considerable, and with the higher strength of aluminium it is often possible to dispense with the armouring used over lead-sheathed cables. Techniques have now been developed for the production of corrugated aluminium sheaths with improved bending characteristics and a lower wall thickness, which is economically attractive. Aluminium is particularly useful for sheathing super-tension pressure cables and for screening telecommunications cables.

At the present level of prices, aluminium-wound transformers are not competitive since the larger tank required offsets the saving in conductor material cost, but a number of transformers have been wound with aluminium and have given completely satisfactory service. Considerable interest has been shown in recent years in the technique of layer winding flat coils, using aluminium foil or thin-gauge strip. Such coils can offer economic and technical advantages over conventional traverse-wound units. Conductor insulation is subject only to interturn voltage, cooling is improved and winding technique is simplified. Strip-wound coils can be insulated by interleaving either with paper or other sheet materials, or by lacquer coatings or anodising which can be applied by continuous processes. A number of prototype units have been produced and are at present undergoing extensive trials.

Aluminium busbar was first used for heavy current connections more than 50 years ago, since when it has been installed in a wide variety of applications, including steel mills, chemical and electro-chemical plant, telephone exchanges, and many factories and workshops. For most applications the magnesium-silicon-aluminium alloy, with its much greater mechanical strength, is preferred and is widely used in industry. Considerable savings can be achieved by the use of aluminium busbar for heavy power installations. Full advantage can be taken of the extrusion process to produce sections of any desired shape, and with the development of semiconductor power rectifiers, aluminium is finding increasing application in the form of finned sections which are used both as busbars and as heat sinks for the rectifiers.

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*Alcan Industries, Ltd.

With the very satisfactory experience on overhead transmission lines, all-aluminium stranded conductors and compression fittings have recently been used for busbar and connections in outdoor substations operating at very high voltages. The most noteworthy examples are in the substations on the Kariba hydro-electric scheme.

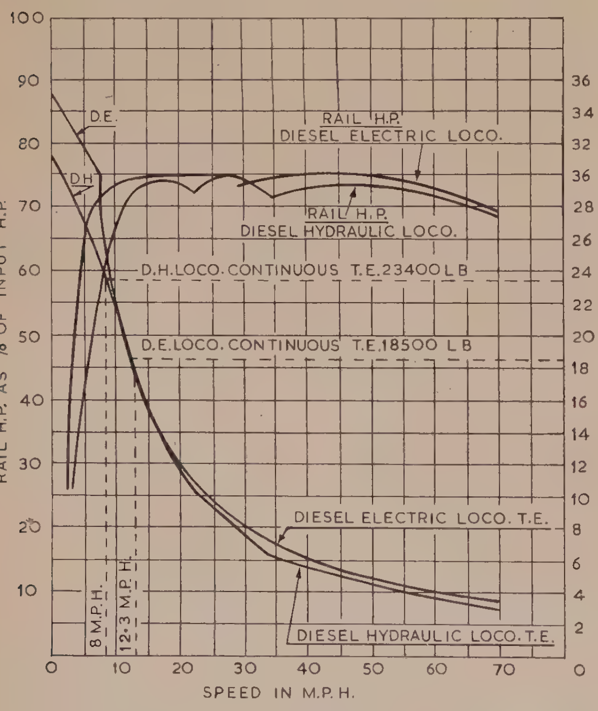
In addition to these applications a number of other projects are under consideration which could considerably extend the use of aluminium in the electrical industry. Particular interest has centred on structural uses, for which strong alloy plates, over 10ft wide, are available for such applications as transformer tanks. Welding, cutting and fabricating techniques are well established, and experience already gained in other industries should enable rapid progress to be made.

Diesel Railway Locomotives

By A. D. SWANSTON, B.Sc., and B. W. TOWELL*

ALTHOUGH experimental main-line diesel locomotives were first constructed some 50 years ago, they employed direct drive, and it was only after electric and hydraulic transmissions were perfected that the diesel locomotive came into its own.

Medium power diesel engines up to 1,000 and even 1,500 h.p. are often of the vertical "in-line" type, while for larger powers a double bank of cylinders in "Vee" formation or two vertical banks with separate crankshafts geared together are frequently used. In certain circumstances a horizontal or "flat" engine may be employed. Much interest has been aroused by the "Deltic" type of engine in which a pair of opposed pistons are fitted in each limb of an equilateral triangle, the horizontal limb of the triangle being at the top of the engine. This arrangement gives a very favourable power-to-weight ratio. Engine speed control can be effected either pneumatically, giving an infinitely variable control, or electrically in a series of predetermined steps.



Characteristics of 827 h.p. diesel-electric and diesel-hydraulic locomotives compared

Electric transmission equipment consists of a main generator, traction motors and the necessary control gear. The generator requirements vary from high current low voltage at starting, to low current high voltage at maximum speed, a characteristic which can be obtained by differential compounding. To ensure that the locomotive is utilising full engine power over the widest possible speed range, the drooping generator characteristic and constant horsepower curve of the diesel engine are arranged to intersect at two points. Load control equipment is usually provided to modify the generator output to follow the engine constant horsepower curve between these points.

Standard practice is to use series wound traction motors, the design being affected by severe space limitation. The leading dimensions depend upon the track gauge, loading gauge and wheel base of the locomotive. The motors are generally axle hung and nose suspended, power being transmitted to the axles through resilient gearwheels.

In a typical 1,160 h.p. Bo-Bo locomotive, the driver's power handle operates a self-lapping valve which increases the air pressure to the engine governor speed setting control and, therefore, increases engine speed and power. Load control is carried out on the constant horsepower section of the curve by variation of the separate exciter field by a rheostat controlled by an oil servo motor incorporated in the engine governor.

The fundamental component of hydraulic systems is the Fottinger convertor, which is essentially a centrifugal turbine and consists of an impeller, a turbine or driven member and a set of fixed blades. The Voith transmission consists of a number of convertors and couplings mounted on the same primary shaft, these being filled and emptied, in turn, with the transmission oil as the locomotive accelerates. The couplings consist of turbine and impeller blades only, without any fixed blades. No gear changing or clutch operation by the driver is necessary, and the speed of the locomotive is controlled by the engine throttle only.

The Mekydro transmission comprises a single-torque convertor, permanently filled with oil, and mechanical speed change gears engaging by over-running dog clutches.

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* The authors are with the Heavy Plant Division of Associated Electrical Industries, Ltd.

To disconnect the engine from the transmission during gear changing, which is accomplished automatically, the turbine blades of the convertors can be momentarily withdrawn from the oil circuit.

System Comparison

An interesting comparison between an 827 h.p. diesel-electric and similar horsepower diesel-hydraulic locomotive is given in the diagram. The rail horsepower is slightly better for the electric than the hydraulic transmission, but the general characteristics are very similar. The tractive effort is rather better at starting with electric transmission but after 10 m.p.h. there is little difference. The total weight of the diesel-electric locomotive is 70 tons, and that of the diesel-hydraulic 59 tons.

The greater weight of the electric locomotive allows full advantage to be taken of the maximum tractive effort characteristic of the electric transmission, while as it is only a small proportion of the total train weight it does not seriously affect fuel consumption.

The principal auxiliary items are engine radiators, auxiliary generators, batteries, exhausters and compressors, blowers for traction motor ventilation and small motors for cooling water circulation, engine lubricating oil priming, etc. Locomotives may be required to work in multiple, for which the control scheme will have to be specially arranged and plugs and sockets provided for interconnection of train wires. On diesel-electric locomotives dynamic braking can be conveniently arranged using force ventilated resistors for power dissipation.

The fairly heavy cost of diesel locomotives makes it essential that the maximum possible use is made of them. Consequently, small variations in efficiency figures between different types of engines and/or transmissions are relatively unimportant when weighed against dependability, availability factor, and frequency and lengths of maintenance periods. Because of the disruption of traffic caused by breakdown, inherent reliability and the ability to move in emergency, even under reduced power, are important considerations.

Automatic Programming for HOT REVERSING MILLS

By T. E. S. RICKARD, B.Sc., Graduate I.E.E.*

A HOT reversing mill is used in the steel industry as a breakdown mill for rolling ingots into slabs or blooms or for rolling plates, etc. The ingot is taken into the mill and reduced to the required finished size. The passage of the ingot is called a " pass " and the period when the ingot is not between the rolls is known as the " interval." During the interval the top roll is screwed down and any necessary manipulation of the ingot takes place.

On early steam-driven mills, the multiplicity of controls required a relatively large number of operators and the mechanical systems used to drive the mill rolls and auxiliary drives were not readily controllable. With the development of a.c. and d.c. contactor drives, however, mill operators were no longer required to exert the same physical effort, although the types of controller used did not immediately improve in design. A further advance came with the development of the Ward-Leonard system of control, together with the use of closed loop control, which gave a more flexible and sensitive type of drive. Use of this system meant that the operator was now further back in the chain of command and the quantities which he was controlling were the relatively small reference signals for the servo control, rather than the main valves on a steam engine. This led to the use of light controllers, and also meant that different drives, such as mill rolls and tables, could be coupled to a common controller, so reducing the number of operators. Even so, the responsibility placed on the mill operator was considerable. The use of voltage controls for mill and table speeds was reasonably satisfactory, as the speed of the d.c. motors was practically proportional to the armature voltage (neglecting field-weakened conditions). However, for screwdowns and manipulators the requirement was for the control of position and in these cases the operator himself converted a voltage control into a position control in the case of screwdowns, for example, so that the correct roll gap was obtained.

The throughput of the mill depended entirely upon the skill of the operator. The sensitivity of the control systems was such that increasing their response without increasing the motor powers excessively would have resulted in only a marginal saving of time so that it was evident that some method of helping the operator to drive the mill was necessary.

Conversion of the screwdown voltage control into a position control would obviously assist the operator to a large extent and, since the rolls would move by the required amount and then stop at the desired place, it should be possible to programme or preset the roll gap settings. This conversion was achieved by attaching a position-measuring device to the screwdown motor shaft, together with a tacho-generator, which gave an indication of the speed of the motor. This tacho provided the necessary stabilising feedback for the position control and was also used as the reset for the alternative manually-operated speed control. Roll position should be controlled, but, due to the backlash of the mechanical parts it was more convenient to control motor position. The position-measuring device might take the form of a potentiometer or other more refined system.

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* English Electric Co., Ltd.

Having achieved a screwdown position control, there are two systems of providing an automatic roll movement. The first is draft selection which is a semi-automatic form of control, and has been found useful on mills where the initial size of the piece is not known sufficiently accurately to permit the screw movement to be made completely automatic. With this form of control, the operator selects the next draft, or alternatively roll gap setting, whilst a pass is being rolled. Operation of a pushbutton initiates the actual roll movement. The second, more refined, system involves programming the mill screwdowns for the complete reduction of a piece to the finished product. With either system of control the sequence may be initiated automatically by photo cells, or manually by the operator.

Several methods are available for storing the necessary programmes. A system extensively employed in this country is that using Post Office type uniselectors which was originally developed by the British Iron and Steel Research Association. With this method the required programmes are wired into the uniselector banks and are selected by the operator by switches which give initial and final piece dimensions, piece temperature, etc. A complete equipment is built up of a number of standard units which may be readily extended to allow for any number of programmes, each made up of any number of passes.

Another method, which is being used in an increasing number of applications, utilises a punched card, together with a card reader of special design. The reader itself incorporates photo transistors, transistor amplifiers and miniature output relays, arranged in plug-in units for easy maintenance and extension. The card is manufactured from a special p.v.c. material and can accommodate any number of functions and passes—increasing the number of passes increases the length of the card. A single card stores a complete programme for one piece, so that the number of programmes determines the number of cards used.

So far, only programming of screwdowns has been considered. Once the basic problem of providing an accurate and fast position control has been overcome, however, the systems described previously can readily be extended to control the speed and direction of rotation of the mill rolls and tables, manipulator position, etc. This natural growth results in a fully programmed, automatic mill, although, as yet, turning or tilting cannot be done so rapidly automatically as manually, so that supervision is necessary for this function, as well as to guard against unforeseen difficulties. For this reason the operator is given over-riding manual controls.

Many developments are in hand on future programming systems. Already computers are available which can calculate the best way to roll metal, and this type of equipment when fed with information giving initial piece size, final product size, production rate and mill parameters will be able to determine the most suitable programme as rolling proceeds.

ELECTRICAL HOUSECRAFT ADVISERS' CONFERENCE

SOME 300 senior demonstrators and housecraft advisers from all parts of the British Isles attended the 27th Electrical Housecraft Advisers' Conference at the Royal Baths Hotel, Harrogate, last week. The conference, organised by the Electrical Development Association and the Electrical Association for Women, was formally opened by Mr. T. E. Daniel (chairman, North Western Electricity Board) on Tuesday, 18th April. A talk on what E.D.A. does to help the saleswoman was then given by Mr. J. A. Stedman and this was followed by an address by Miss Mary George (director, E.A.W.) who spoke of the support given to the saleswoman by the E.A.W.

The remainder of the first morning's session was devoted to a talk by Mr. A. Mackenzie Parkinson, who dealt with the part played by the manufacturers and their demonstrators. Speaking on behalf of B.E.A.M.A. domestic appliance manufacturers, he said that ten years ago there were four gas cookers sold for every electric cooker, but in 1960 the ratio was down to almost one for one. The average rate of sale of washing machines was even greater—home sales for last year being in excess of 1·2 million. He forecast that by 1963 automatic machines would represent a third of washing machine sales and models fitted with a hand wringer would completely disappear. He also paid particular attention to refrigerators, the third major domestic appliance. Home sales, he said, had risen from just below 200,000 in 1956 to 1 million in 1960.

Miss M. J. Gordon (Godolphin and Latymer School) was the first speaker during the afternoon session, which dealt with the demonstrator and the schools. Miss Gordon outlined the needs of the schools and three of the Boards' housecraft advisers—Miss K. E. Piatt (Midlands), Miss D. M. Findon (South Western) and Miss A. Licence (South Eastern)—in turn explained what the demonstrator could do.

Wednesday's sessions dealt with the latest practice in kitchen planning, discussed by Mr. A. L. Osborne (E.D.A.), and lighting in the home, on which the speaker was Mr. A. Wilcock (British Lighting Council). The technique of selling was discussed on Thursday morning and during the afternoon Miss Cynthia Shirley (English Electric Co.) and Miss Joan Whitgift (Simplex) were among those who spoke on home laundry equipment.

The conference closed on Friday with a general discussion followed by a luncheon at the Crown Hotel.

Miss Mary George, director of the E.A.W. (right), presenting the Elizabeth Sloan Chesser Cup and replica to Mrs. R. M. Robinson, of the South Eastern Electricity Board, Twickenham. The cup is awarded annually to the demonstrator gaining the highest marks for the E.A.W. Diploma in Electrical Housecraft

INDUSTRY AND THE HOUSE

Debate on the Budget

By GEORGE DARLING, M.P.*

MR. SELWYN LLOYD'S first Budget has had a curiously mixed reception, especially from his own supporters, all of whom have welcomed and praised it, but for many different and often conflicting reasons. Indeed, Mr. David Price—who speaks with some authority on fiscal matters as an I.C.I. executive—described it as sober, cautious, imaginative, bold and socially just in the space of five sentences. Newspapers, too, have offered perplexing comments in attempting to prove that it is both radical in purpose and typically Tory in content.

The reason why a simple summing up is difficult is that the Chancellor has produced a somewhat revolutionary Budget based at one and the same time on socialist conceptions of economic planning and Conservative principles of taxation. He has tried to weld two conflicting political views into a pragmatical whole. The usual Party disputes—apart from inevitable disagreements over surtax, profits tax and social services charges—have boiled down to a technical debate on whether the main proposals will work satisfactorily. And even this debate is confused because the two most important fiscal changes have still to be explained. They are not in the Budget.

The Chancellor expressed his aims clearly enough. "There are things that are wrong in our approach to economic problems," he said. "We are trying to do too much at the same time—a high and growing level of consumption, a large defence effort, expanding social services, high levels of investment—all the time knowing that we have to earn our living in the world by exports. Our productivity is held down by shortages of skilled labour. We have too few scientists and technicians. Features in our tax system make for inadequate rewards for initiative and enterprise. Some industries are insufficiently accustomed to competition. Labour relations, standards of management and techniques of selling are, in some cases, below what is needed today. Certain industries are still handicapped by out-of-date restrictive practices."

Chancellor's Cures Questioned

No one will quarrel with this terse and pertinent diagnosis of our economic ills. The question is, has Mr. Selwyn Lloyd prescribed the right cures? First, he aims—as have all his predecessors since 1951—to keep Government expenditure within our means. To do this he wants us to pay more for car licences, fuel oil, health services and television advertisements. Second, he hopes to stimulate top-level enterprise by reducing surtax, abolishing it in fact on incomes below £5,000. He is going to make shareholders provide these extra incomes for executives. The higher profits tax will balance the surtax reliefs.

Third, he discards such monetary devices as the Bank Rate and hire-purchase regulations as imperfect instruments for checking a too-rapidly expanding home trade, and intends to introduce two new regulators: a payroll tax, and changes up or down in purchase tax, beer, tobacco, petrol and some other duties, in between Budgets, to keep the economy on an even keel.

These proposed cures were summarily dismissed by Mr. Harold Wilson as inadequate, irrelevant and, so far as the regulators went, unworkable. He, too, offered a similar diagnosis of the ills to be cured to sustain his criticisms of the Chancellor's proposals. Other critics followed the same line. There was no dispute about the need to keep public spending within, as the Chancellor put it, "the prospective growth of our resources," nor about the need for long-term planning of Government expenditure, which a team of Treasury experts is studying.

In fact, what everybody is seeking is the means to stimulate an expanding economy, with price stability, a satisfactory balance of payments, greatly increased exports and higher living standards. And the real conflict of opinion arose over the question of priorities. Where do you begin? What comes first?

Growth the First Essential

Mr. Roy Jenkins claimed that the only effective order was to put economic growth, industrial expansion and higher exports first and foremost. All our efforts should be devoted to that purpose. He is convinced that the Tories' preoccupation with the balance of payments position, of trying desperately to keep it in balance almost month by month, had handicapped trade and frustrated industrialists. And they had failed to achieve the balance they sought.

Mr. Harold Wilson was also convinced that the balance of payments position would continue to be unsatisfactory if industrial growth remained low in the order of priorities. He and other speakers criticised the Chancellor's new measures for their lack of selectivity. Surtax reliefs, if they encouraged anyone to be more enterprising, would encourage the importer, the property speculator, the advertisement manager and the operators of strip-tease parlours as much as the genuine industrialist and exporter. The proposed payroll tax, too, would put up the exporter's costs as much as the manufacturer's who made trivialities for the home market. And the profits tax did not discriminate between those who used their profits wisely and those who dispersed too much to shareholders.

This lack of discrimination found some critics among Conservatives, but on the whole the Government's supporters were more given to praise than criticism. Indeed, Mr. Maudling gave them a welcome lead by producing last year's figures of industrial output, investments and exports which appear to show we are not doing too badly.

Nevertheless, the Chancellor himself had thrown doubts on the comfort we can derive from our present and past

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* In the absence of our regular Parliamentary commentator, Mr. Austen Albu, who is on an overseas tour, Mr. Darling kindly agreed to provide these views on the Budget speech and debate.

Medical Electronics

By PROFESSOR RONALD WOOLMER, B.M., B.Ch.(Oxon.), F.F.A.R.C.S.*

This article is based on the Fifty-Second Kelvin Lecture which was prepared by the author and delivered at an ordinary meeting of the Institution of Electrical Engineers yesterday (Thursday)

MANY of the products of the electrical engineer, such as control devices, computers and servo systems, have their counterparts in nature. In most cases the engineer has produced his devices not by copying nature, but by working from first principles. The elaboration of these principles has proved of value to the biologist in helping him to understand the natural systems, which are often complex, to study the ways in which they may fail, and to design substitutes for them.

As an example, we may consider the natural control system by which the depth, the volume and the rate of breathing is regulated. The regulating parameter is the level of carbon-dioxide in the arterial blood. This level is continuously measured by a natural sensing device of unbelievable delicacy. The information is passed on by a neural receptor link to the control centre in the brain, where it is compared with a stored optimum. The resultant difference signal modulates the output passing over the neural motor link to the motor organ (the respiratory muscles). Negative feedback from the motor organ to the control centre ensures smoothness of action. The range between normal and maximal output is about 20. The system may be inactivated, wholly or partially, by diseases such as paralytic poliomyelitis and by narcotics and other poisons. During surgical operations it is often deliberately suspended by the anæsthetist. It is not too difficult to provide artificial substitutes for the neural links, the motor organ, and even the control centre; but attempts to duplicate the natural sensing mechanism are less successful.

To enable the biologist to use electrical systems for measurement and control, it is necessary to derive electrical outputs proportional to many of the changes which take place in the body. Transducers for temperature, pressure and flow are therefore important not only for biological research and medical diagnosis, but also to enable life to be maintained, during surgery of the heart for instance, when important natural systems are temporarily inactivated. Other bodily changes already have their outputs in electrical form. The electrocardiograph and the electroencephalograph, for instance, display the electrical activity of the heart and the brain without the intermediary of transducers.

Whereas the engineer would measure the pressure in a hydraulic system by attaching a side tube and pressure gauge, this method cannot be used for the routine measurement of the pressure in the arteries. An indirect method has to be used instead. A short segment of upper arm is squeezed by air pressure. As soon as this pressure exceeds the peak pressure in the artery, the flow of blood through it ceases, and the peripheral pulse disappears. The applied pressure, at this moment, is the same as that within the blood vessel, and is easily measured. A continuous indication of the blood pressure during surgery is often needed. This can be provided automatically by a blood pressure follower, which consists of a pulse detector (which may be a pressure transducer or a photo-reflexive system) a solenoid valve, a source of compressed air, and a recording manometer. This provides the operating team with a record of changes in blood pressure during surgery. The output of measuring devices may also be used, in servo systems, for automatic control. An example is the servo-anæsthetiser for maintaining a constant level of anæsthesia. The integrated output of the electro-encephalogram, within certain frequency bands, is related to the depth of anæsthesia, and may be used to control the rate of administration of the anæsthetic. The relationship is influenced by other factors, however, and though these could in theory be corrected for, in practice it is more satisfactory to achieve control by human agency.

Electronic techniques of the type developed for process control are finding increasing uses in medicine and biology, as aids to diagnosis, as tools for research, as a means for establishing stable states, and as a means of providing artificial aids to overcome defects in the natural systems. This demands a knowledge by the biologist of the principles of electrical engineering, and a knowledge by the engineer of the limitations imposed by biological systems on normal engineering practice. The benefits to mankind which an increase in such knowledge can bring are great.

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* Royal College of Surgeons of England.

Atomic Energy Discussions in Australia

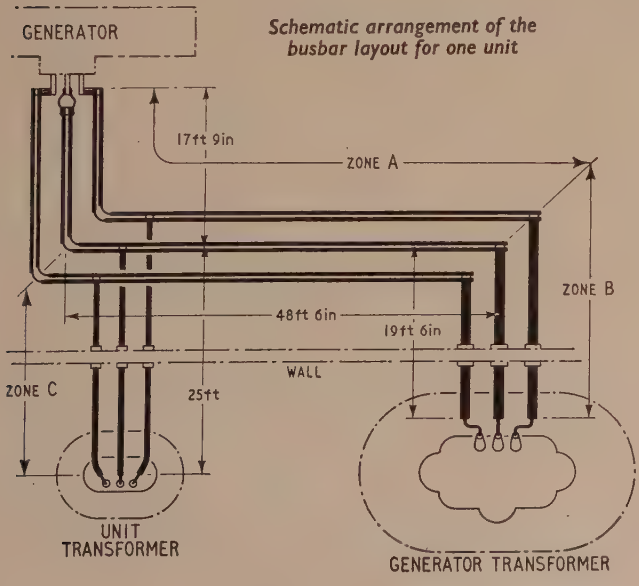
A three-man mission from the United Kingdom Atomic Energy Authority arrived in Sydney on 19th April for discussions with the Australian Atomic Energy Commission on research co-operation. The mission consists of Dr. H. Kronberger, O.B.E., deputy managing director (development), Reactor Group, Mr. L. Grainger, assistant director, Atomic Energy Research Estabilshment, Harwell, and Mr. R. C. Orford, commercial and overseas manager, Reactor Group.

Aluminium Busbar Tests

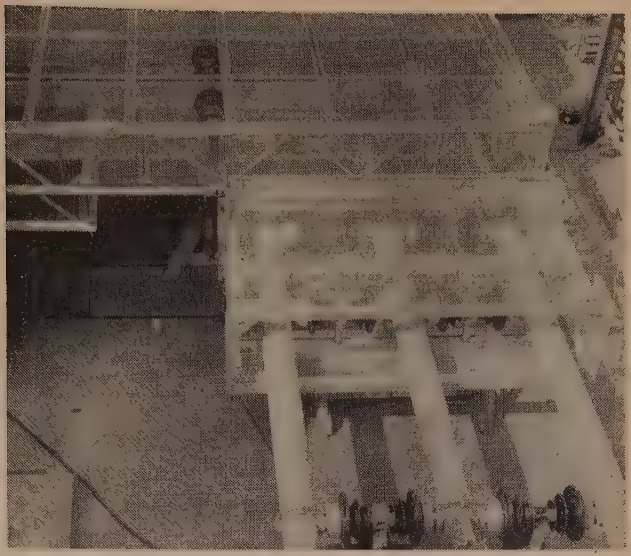
WHEN completed, the generating station being erected at Komati in Eastern Transvaal by the Electricity Supply Commission of South Africa (ESCOM) will be the largest in Africa with a capacity of over 1,000 MW. The first two 100 MW turbo-generators, manufactured by the German A.E.G., will be commissioned towards the end of this year. For the first time aluminium busbars are being used by ESCOM for connections between the generators and the main and unit transformers. Each busbar assembly weighs about 3 tons and the screening, which is also of aluminium, brings the total weight to about 6 tons. The delta/star generator transformers, made by A.S.E.A. of Sweden, are each rated at 110 MVA and have a reactance of 12·3 per cent, a normal primary current of 6,050 A and a voltage ratio of 10·5/300 kV. The 10 MVA unit transformers, manufactured by Ansaldo-San Giorgio, of Italy, have a reactance of seven per cent and normal primary and secondary currents of 525 and 875 A respectively. They are star/star connected with a voltage ratio of 10·5/6·9 kV.

The maximum fault level after the current limiting resistances is 100 MVA. Fault capacity at the main transformer arising from the system is 12,500 MVA at 275 kV. The generators are earthed through a 5 kVA neutral earthing transformer having an equivalent resistance of 3,000 Ω at the generator rated voltage. The h.v. neutral of the main transformer and the l.v. neutral of the unit transformer are solidly earthed.

The installation is in three main zones. The bars are of Alcan D50S magnesium silicide alloy sections having a minimum tensile strength of 29,000 p.s.i. and a minimum conductivity of 55 per cent I.A.C.S. For the busbars in zone "A" 10in double channel is used, the bars being spaced at 41in centres, while for zone "B" 10·75in diameter tubes with a 0·5in wall thickness are employed, spaced at 47in centres, to simplify the design of the through-wall bushings. The bars in zone "C" are of 3in nominal bore tube at 34¼in centres. The estimated total impedances of these sections at rated loads are 42, 46 and 62 $\mu\Omega$/ft and the estimated resistances at 20°C are 1·015, 0·92 and 6·63 $\mu\Omega$/ft respectively. The enclosure is built up of angle and tee sections with expanded aluminium screening welded in the panels. The equipment complies with B.S. 159 "Busbars and busbar connections" and B.S. 2817 "Enclosure of electrical parts."

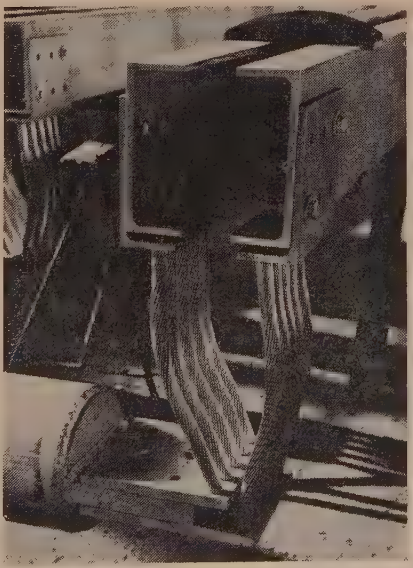


Schematic arrangement of the busbar layout for one unit



The circular busbars of zone "B" and the expanded metal screening can be seen in this view of the installation under test

Last week we were able to see some of the tests on these busbars at the short circuit testing station of Crompton Parkinson, Ltd., at Chelmsford. These included



A view taken during erection of the connector used to couple the 10in double channel section to the 10·75in diameter tube busbars power frequency voltage tests of 55 kV r.m.s. for a minute on each phase in sequence, and short time current tests of the installation's thermal and physical strength. For zones "A" and "B" this necessitated withstanding a current of 46·1 kA for three seconds and for zone "C" the requirement was a current of 82·1 kA for three seconds. A maximum temperature rise of 300°C was permitted. At the instant of short circuit a 70 per cent d.c. component was required on the centre phase. Since a current of 82·1 kA was beyond the capacity of the testing station, an equivalent test in accordance with paragraph 22 and appendix F of B.S. 159 was permitted; in this a current of some 62 kA was passed for a longer time to produce the same heating effect. In tests to ensure a maximum temperature rise of 30°C under normal conditions, currents of 6·6, 6·26 and 1·52 kA were passed in the bars of zones "A," "B" and "C" respectively. A current of 6·6 kA for several hours exceeded the capacity of the testing station and approval has therefore been given to extrapolate the temperature rise at full current from a series of tests carried out at currents up to about 3 kA.

The contract for the first two busbars was awarded to Hubert Davies & Co., Ltd., of Johannesburg, the aluminium busbar components being supplied through Alcan Aluminium of South Africa, Ltd. The busbars were designed and fabricated by the Aluminium Company of Canada, Ltd., and the screening was manufactured by G. & E. Engineering, Ltd., of Clapham, London. All the insulators were supplied by Steatite & Porcelain Products, Ltd.

Electrical Installation Practice

MANUFACTURERS' AND USERS' VIEWS

A DISCUSSION was held last week between manufacturers and users of electrical equipment as part of the Association of Supervising Electrical Engineers' national lecture programme. The discussion, which took place in the Institution of Electrical Engineers, was led by a panel of experts. Sir Willis Jackson, president of the A.S.E.E., was in the chair.

The meeting commenced with a short contribution by each member of the panel. Mr. A. E. Gaster (Ewbank & Partners) said that as a consulting engineer he required from the client a complete, practicable, final and unalterable decision so that a specification could be issued to meet the building programme. From the manufacturer, the consulting engineer required equipment which not only met the regulations and standards, but was also of high engineering quality with adequate provision to wire and fix glands. A manufacturer should also take into consideration that the equipment might be handled on site, stored and installed in conditions far from ideal before it was finally commissioned.

On behalf of manufacturers, Mr. R. H. Phillips said that they were faced not only with regulations in this country but with overseas regulations. These caused great difficulty because overseas regulations were, in many cases, not only different from ours, but were enforced. There were instances where British Standards had been in use for a long time and had subsequently been wholly or partly amended. There seemed to be no general move in the industry to use the latest edition of a specification and there was no authority in this country which would ensure this. With regard to small accessories, Mr. Phillips asked whether it was thought that the 13 A socket was sufficient for all domestic, commercial and industrial purposes up to 3 kW, or if we were to perpetuate the mixing of 13 A plugs and sockets with the round pin 2, 5 or 15 A variety.

For the users of electrical equipment, Mr. C. A. M. Thornton said that it was high time that conventional motor protection devices were replaced by those operated by winding temperature only. The question whether such devices should be normally open or normally closed should be decided at the earliest possible stage. With the growth of distribution systems, the MVA to be ruptured in the event of a fault in a motor cable box had often outgrown the capacity of the box to withstand it. Mr. Thornton thought that there should be considerable strengthening of cable boxes and the anchoring of the cables within them. There should also be adequate means for the relief of excess pressure, without permitting entry of moisture, dust or fumes into the box.

The electrical contractors were represented by Mr. C. J. Veness, who said that in the design of electrical equipment due consideration should be given to easy and quick installation and subsequent maintenance.

The meeting was then thrown open to discussion. One member of the audience felt that insufficient attention was paid to interchangeability by manufacturers; in particular standard fixing centres should be adhered to for similar types of equipment. Mr. Thornton felt that such standardisation would tend to freeze design, but Mr. Gaster thought that in many cases it was a question of fashion or change for the sake of change.

A communicated question, read by Sir Willis Jackson, asked the panel to discuss the advantages of double insulation over direct earthing. Mr. Gaston thought that this was a question of how much reliance could be placed on the earthing system and Mr. Thornton thought that the earth conductor was more fallible than double insulation. If the inner insulation broke down, said Mr. Veness, it would probably not be tested and consequently he did not feel that double insulation was the safer method. A member of the audience pointed out that no protection could be provided for double insulated equipment.

On the question of delay between the initiation and date of publication of Codes of Practice and Standards, it was suggested by Mr. Mathieson that some of the drafting work could be done in the evenings or spare time. In answer to another question, the panel agreed that there was some justification for the restriction by some Area Boards of direct-on-line starting to small motors.

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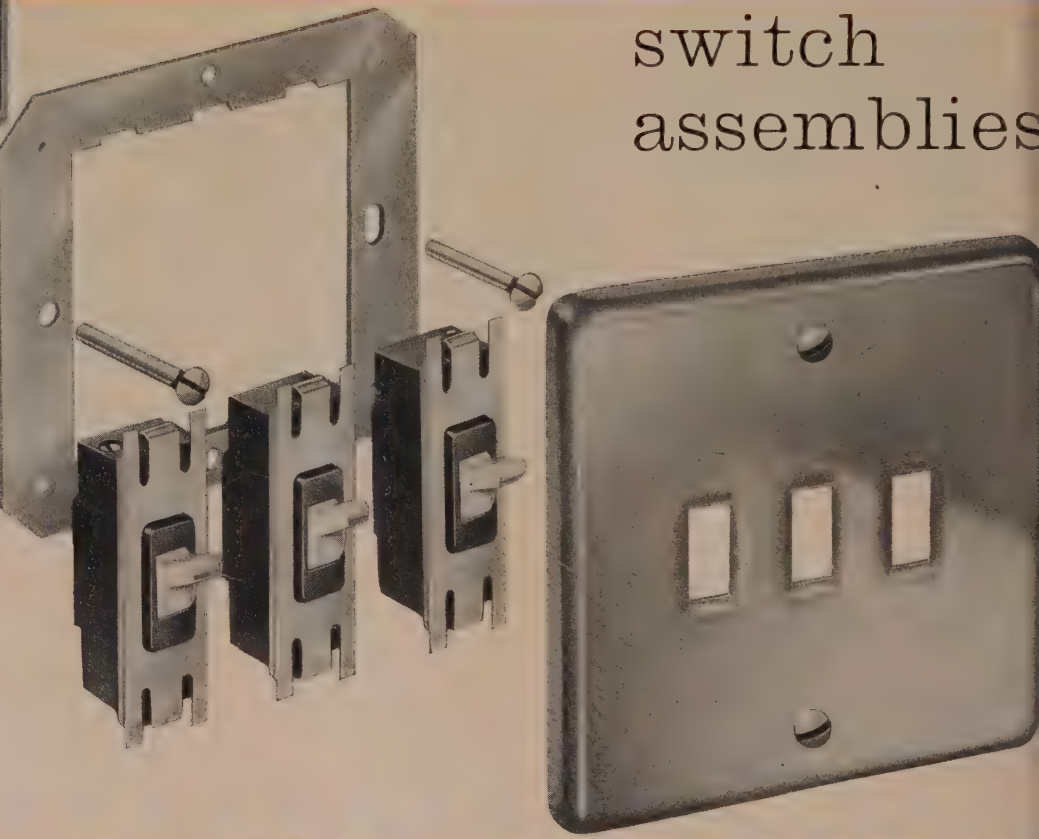

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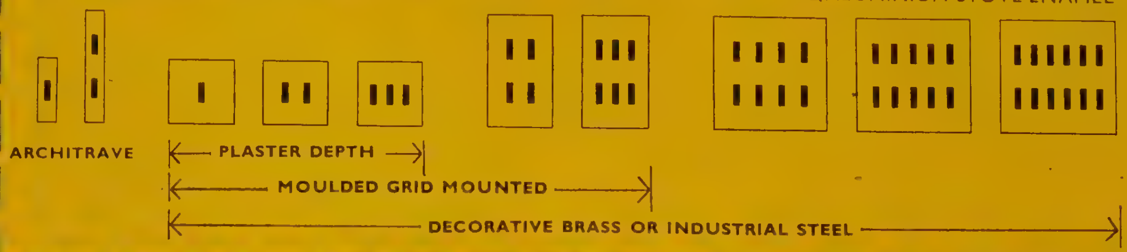

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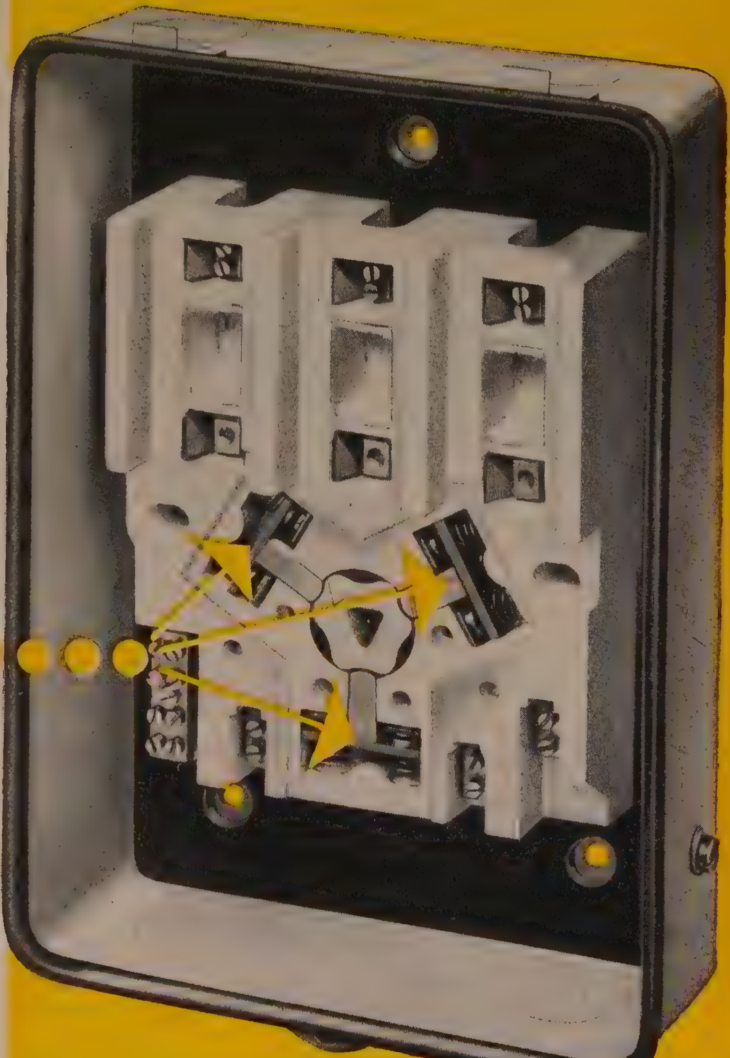

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S.4

VIEWS on the NEWS

By "REFLECTOR"

THE "unveiling" of the reconstructed home of the Institution of Electrical Engineers just off the Victoria Embankment (i.e. the removal of the scaffolding and sheeting) has revealed a very handsome facade. Dwarfed by its neighbours—the Savoy Hotel and Brettenham House—the building seemed drab and insignificant. It has been heightened and the front has been refashioned and refurbished so that now the building is more worthy of one of the country's leading engineering institutions.

* * *

In E.P.E.A. circles there is much debate upon the subject of overtime. The members of the Association are unanimous that it should be paid for in some shape or form although some of them would like to see it ended, usually by the engagement of more staff. Perhaps the best suggestion so far emanates from the Brighton Section; it is that (says the *Electrical Power Engineer*)

> "for any hours worked in excess of normal office hours, time off in lieu should apply, in addition, a professional fee of £15 15s should be paid for time worked in any 24-hour period from 9 a.m. to 9 a.m."

* * *

Southport's completion of its changeover from gas to electric lighting has had almost as much publicity as the Blackpool illuminations receive each year. It has been said that the lighting of the borough's 250 miles of streets by electricity means a saving of over £17,000 a year. The work has been carried out by the municipal lighting department and the Merseyside & North Wales Electricity Board was responsible for the extensive cable work involved. There was a little confusion at a ceremony held to mark the completion of the conversion. The Mayor, raised on a maintenance tower, turned off what was said to be the last gas lamp. But some way off there was an "unofficial" turning off of another lamp and it was stated that eight others around the town were still in operation.

* * *

Credit must be given to the Friends of the Lake District who, in their desire to prevent the erection of overhead lines in Borrowdale, are willing to support their views with hard cash. Members of the society have received a circular in which the secretary refers to the recent public inquiry into the subject. The North Western Electricity Board had already agreed to use underground cables in supplying the Grange and Rosthwaite in Borrowdale but wished to erect about 1⅓ miles of overhead lines in parts of the area. The Friends offered to contribute £5,000 towards the cost of putting the lines underground and hope that even if the Minister of Power consents to the use of overhead lines the Board will still voluntarily use cables and accept the sum offered.

* * *

My attention has been drawn to an advertisement in a women's journal to what looks to be a very useful device. This is an "electronic pools computer" which, the makers claim, "used consistently . . . vastly increases your chances of winning." If it doesn't do better than "Ernie," that other electronic gambling device, I shall have nothing to do with it.

* * *

A correspondent tells me that the Australian Coastal Shipping Commission is investigating the possibility of employing large electro-magnets instead of ropes for mooring ships in wharf berths. If it is found feasible, the magnetic system will first be used for Australian National Line ships on the Melbourne-Tasmania run. One of the line's masters has said that the use of ropes was too costly in terms of time and manpower; the new system had not yet been tried out anywhere in the world. My correspondent believes this to be wrong and that there is a system of this kind in use at Hamburg for a ferry service. I am reminded by all this of the classic story of the mountain of lodestone to which ships were involuntarily moored.

* * *

Correspondence in the *Electrical Review* seventy years ago was often much more vituperative than it is today. I extract the following example from the issue of 24th April, 1891:—

> "Although I do not consider holding a controversy with a person of Mr. A. S. Elmore's type the most exhilarating way of disposing of one's time, I will reply as briefly as possible to the heterogeneous hash, which, bearing that individual's signature, appeared in your last issue. This latest offset of the Elmore family tree has endeavoured, by a series of misleading extracts, to show that the publication of chemical or electro-chemical data—the results of mere laboratory experiments, for example—renders void any patents subsequently obtained, in which such data necessarily became involved in the practical applications of science to the arts. If Mr. A. S. Elmore's notions were the law of the land—which, happily, they are not—the functions of the patent office could very well be dispensed with so far as electrolytic processes are concerned."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Sir William Penney, vice-chairman, U.K. Atomic Energy Authority, has been appointed by the International Atomic Energy Agency to succeed Sir John Cockcroft as a member of the Agency's Scientific Advisory Committee.

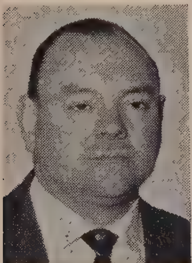
Mr. N. M. Miskin, M.A.(Oxon.), has been appointed to succeed Mr. K. F. A. Johnson as legal adviser to the British Electrical and Allied Manufacturers' Association. He will take up his appointment on 1st May. Mr. Miskin is a barrister and practised for a number of years before undertaking legal responsibilities in industry. He is at present with the Federation of British Industries.

Mr. N. M. Miskin

Mr. S. A. Hunter, A.M.I.E.E., has been appointed to the board of Foster Transformers, Ltd., and **Mr. P. Huggins,** M.I.E.E., to the board of Lancashire Dynamo & Crypto, Ltd., both companies in the Metal Industries Group. Mr. Hunter, who has been sales manager of Foster Transformers since 1958, becomes sales director and Mr. Huggins, chief engineer with Lancashire Dynamo & Crypto since 1950, is now technical director.

Mr. Hunter was educated at Foyle College, Londonderry, and the College of Technology, Birmingham, where he was a lecturer from 1940 to 1944. He joined Foster Transformers as Midlands manager in 1946 and was appointed sales manager in 1958.

Mr. Huggins served his apprenticeship with Crompton Parkinson, Ltd., joining the Brush Electrical Engineering Co., Ltd., in the early 1920s as a senior electrical designer. He later served with the British Jeffrey Diamond Co. and the Royce Crane Co. before joining Lancashire Dynamo & Crypto, Ltd., as a senior electrical designer in 1928. He became chief designer in 1945 and chief engineer five years later.



Mr. S. A. Hunter

Mr. P. Huggins

Consequent on the appointment of Dr. R. Spence, C.B., F.R.S., as deputy director of the Atomic Energy Research Establishment, Harwell, **Dr. W. Wild** has been appointed head of the Chemistry Division. **Mr. A. A. Smales, O.B.E.,** head of the Analytical Chemistry Branch, has been given the status of a division head and will be directly responsible to the director for the scientific work under his control.

Mr. D. H. Davies, M.I.E.E., Associate I.Mech.E., mechanical and electrical engineer of the Consolidated Gold Fields of South Africa, Ltd., retired on 21st April after 32 years' service. Mr. Davies was concerned with the provision and maintenance of plants at the company's mines all over the world and is well known both in the mining world and the industry.

Mr. D. H. Davies

The Minister of Labour announced in the House of Commons on 17th April that he had appointed a committee to inquire into the selection and training of supervisors. The members include **Mr. R. D. V. Roberts** (industrial relations adviser, Electricity Council), representing the nationalised industries.

Mr. H. T. Chapman, C.B.E., F.R.Ae.S., M.I.Mech.E., has resigned his appointment as deputy chairman of Bristol Siddeley Engines, Ltd., but retains his seat on the board. He is appointed chief executive of Hawker Siddeley Industries, Ltd., as from 1st May.

Mr. A. A. Bruneau and **Mr. R. J. Moyse** have been elected directors of Alcan Industries, Ltd.

Mr. J. F. Ransom, whose appointment as sales manager of the Hackbridge Cable Co., Ltd., was reported in our last issue

Some 400 members and friends of the **A.E.I. (Willesden) Long Service Association** attended the 15th annual reunion at Wembley Town Hall on 20th April. Active membership of the Association, which is open to employees who have completed 25 years' service, is now 350, to which can be added 100 honorary members (those who have either retired or transferred from Willesden). The chief guest of the evening was Mr. H. West (managing director, A.E.I. (Manchester), Ltd.), accompanied by his wife. Mr. J. R. Wilkinson (divisional director and general manager, Switchgear Division) and Mrs. Wilkinson were also among the guests. During the evening a bouquet was presented to Mrs. West by Miss Edith Gill, an Association member with 34 years' service. Dancing and an excellent cabaret combined to make the evening its usual success.

The latest production of the **Portland Players** (dramatic section of the Central Electricity Headquarters Sports and Social Club) was the 21st presentation since they were formed in 1949. Entitled "An Inspector Calls," it was presented at King George's Hall, London, on 17th and 18th April.

This particular play is not one of the easiest of J. B. Priestley's to put over for an amateur company and the fact that it was chosen, knowing that it was also entered for the 1960-61 Electricity Supply Industry Drama Competition, was in itself commendable. It is an intense play, unrelieved by comedy, and once again Jane Turner had the opportunity to play an emotional part as the daughter, Sheila. In this she was ably supported by Irene Ferrari as the mother. Of the cast of seven, all of whom worked well, special mention may be made of John Ashton, cast in the difficult role of the inspector.

Mr. R. I. Kinross, M.I.E.E. (Rediffusion Research, Ltd.) has been re-elected president of the Society of Relay Engineers and **Mr. R. P. Gabriel,** M.I.E.E., A.M.Brit.I.R.E. (Rediffusion, Ltd.), vice-president.

Mr. Arthur Clarkson

As a result of the reorganisation of the company, **Mr. Arthur Clarkson,** F.I.A.M.A., is to leave the General Electric Co., Ltd., with whom he has been for the past forty years, at the end of this month. Mr. Clarkson was appointed controller of publicity of the G.E.C. in 1959, having previously been deputy publicity manager. During his service with the company Mr. Clarkson has become very well known and popular in the fields of advertising and publicity in the electrical and radio industries. He has served on the B.E.A.M.A. Publicity Committee; he was vice-chairman of the Public Relations Committee of the Radio Industry Council; and he is a member of the Council of the Advertising Association and also of the Council of the Audit Bureau of Circulations. We hope that his wide experience will not be lost to the industry.

As part of the programme of rationalisation being carried out by the Ekco Group, two new companies have been formed—Ekco Radio & Television, Ltd., to control the marketing of all Ekco television and radio receivers, car radio and allied products; and Ekco Heating & Electrical, Ltd., to be responsible for the marketing of the wide range of Ekco heating equipment and electric blankets. **Mr. R. Wrathall,** formerly radio and television sales manager of E. K. Cole, Ltd., is director and general manager of Ekco Radio & Television, Ltd., and **Mr. C. B. Cleland,** formerly general manager of E. K. Cole's Heating Division, is director and general manager of Ekco Heating & Electrical, Ltd. Mr. W. M. York is chairman of both companies and other directors are: Ekco Radio & Television, Ltd.: Messrs. E. B. Willcocks, N. T. Atkinson and A. C. Segger. Ekco Heating & Electrical, Ltd.: Messrs. A. J. Brunker, S. A. Clodd and E. Walley.

The appointment of three additional directors to the board of Ferranti Radio & Television, Ltd., is announced. **Mr. R. A. Drummond,** who has been with the Ekco Group for nearly 30 years and who has been sales manager of Ferranti Radio & Television, Ltd., since its formation, becomes director and general manager. The other new directors are Mr. N. T. Atkinson and Mr. A. C. Segger.

It is also announced that **Mr. D. J. Cole,** B.A., LL.B., has been appointed to the board of E. K. Cole, Ltd. Son of the founder and present chairman of the company, Mr. Cole was educated at Oundle and at Jesus College, Cambridge, where he held a scholarship in history. He joined E. K. Cole, Ltd., in 1954 and subsequently spent eighteen months with an associate company in Australia. Since 1958 he has been concerned with market research in Europe in relation to the Common Market and Free Trade Area.

The Bristol Branch of the **Electrical Association for Women** held its 31st annual dinner recently when the principal speakers were Mr. A. C. Thirtle (regional director, C.E.G.B.), Miss Mary George (director, E.A.W.), Viscountess Kilmuir and Mrs. J. Dorrinton (Branch chairman). Others present included the Branch president, Mrs. A. N. Irens, accompanied by Mr. A. N. Irens (chairman, South Western Electricity Board), and Mr. H. S. Davidson (divisional controller, C.E.G.B.) and Mrs. Davidson.

Mr. P. D. Mitchell, formerly assistant sales manager, Polypenco, Ltd., has been appointed technical sales manager. **Mr. E. Smedley** becomes sales office manager.

Mr. R. Wrathall

Mr. C. B. Cleland

Mr. R. A. Drummond

Mr. D. J. Cole

Mr. J. Kerr (William C. Yuille & Co., Ltd., Glasgow) receiving the E.I.B.A. Silver Rosebowl from Mr. G. Conradi, president of the E.W.F., on the latter's last day of office. The trophy was won by the Scottish Section of the E.W.F. for the first time for having achieved the highest average collection per member during 1960 in aid of the E.I.B.A.

Group Captain F. C. Daubney, C.B.E., has been appointed chairman of Creed & Co., Ltd.; he will also continue to be managing director. After service in the Royal Air Force, the Air Ministry and Foreign Office, Group Captain Daubney joined Creed & Co. in 1949 and was made commercial manager the following year. He later became general manager and was appointed managing director in 1957.

It is also announced that **Mr. F. W. Helmer,** B.Sc.(Econ.), has been elected a director of the company. He joined Creed 42 years ago as a junior clerk and was made secretary and comptroller in 1956.

Mr. Arthur Bulgin (A. F. Bulgin & Co., Ltd.) has been elected president of the Radio and Electronic Component Manufacturers' Federation, in succession to **Mr. E. M. Lee** (Belling & Lee, Ltd.). Mr. Bulgin was one of the six manufacturers who met in 1932 to form the Federation. **Dr. G. A. V. Sowter** (Telcon Metals, Ltd.) succeeds **Mr. Hector V. Slade** (Garrard Engineering & Manufacturing Co., Ltd.) as chairman. Mr. Slade and Mr. K. G. Smith (N.S.F., Ltd.) have been elected vice-presidents.

Mr. H. K. Hartley has been appointed general sales manager of Fawcett Preston & Co., Ltd., a member of the Metal Industries Group.

On 15th-16th April the **I.E.E. London Student and Graduate Section** held a social week-end which was attended by 60 members and friends from all parts of the country. Of special interest were the visits to the International and Continental Telephone Exchanges and the Electrical Research Association establishment at Leatherhead. The non-technical events included visits to the Houses of Parliament and Drury Lane Theatre to see "My Fair Lady."

Mr. J. A. P. Firth, M.I.E.E., manager of the Solihull District of the Midlands Electricity Board, has been appointed manager of the Birmingham South East District in succession to **Mr. L. Harvey,** M.I.E.E., who, as previously announced, takes up a similar position in the Birmingham South West District. Mr. Firth was previously manager of the Leek District (1953-60) and before that of the Stoke South East District (1949-53).

Mr. Roger A. Bones, B.Sc., Ph.D., A.Inst.P., has joined the Wayne Kerr Laboratories, Ltd., as head of the Contracts Division. **Mr. Graham Miller** has been appointed home sales manager of the company.

Mr. R. G. Hubbard has been promoted to the newly created position of divisional sales manager, Kenwood Electric Division.

Mr. D. L. Lewis, senior lecturer in electrical engineering at Loughborough Training College of Further Education, has been appointed head of the Electrical Engineering and Science Department of the City of Bath Training College.

Mr. D. R. T. Kidd, B.Sc.(Eng.), has recently joined Cooper Electroheat, Ltd. He was formerly with the Transformer Division of the English Electric Co., Ltd., and was for a short time with their Export Department in London.

Mr. S. H. Reece has joined the board of Cobra (Wood Treatment), Ltd.

Mr. D. J. Anelli has been appointed export manager of Geo. Salter & Co., Ltd. He succeeds **Mr. C. P. Turnbull,** who has left to take up another appointment.

OBITUARY

Mr. J. W. Graely.—The death occurred recently of Mr. John W. Graely, M.I.Min.E., M.Inst.F., M.B.I.M., the education and training officer of the Central Electricity Generating Board. Mr. Graely, who was born at Leigh, Lancs., in 1900, was formerly with Newton, Chambers & Co. and then director of the Nuneaton Staff College of the Ministry of Fuel and Power. He joined the former British Electricity Authority in 1949 as resident tutor at Horsley Towers, Surrey, later becoming deputy education and training officer.

Mr. E. G. Rowledge.—We regret to record the death of Mr. Eric George Rowledge, a well-known figure in the British refrigeration industry, which occurred suddenly during a visit to the Prestcold factory at Swansea on 19th April. Mr. Rowledge, who was sixty-three, was chairman of the Domestic Refrigeration Development Committee (DoRDeC) and a former chairman of the British Refrigeration Association. He joined the Pressed Steel Co. in 1934 as chief engineer of the newly formed Prestcold Division. Later he became general manager of Prestcold and was appointed a local director of the company in 1952. He joined the divisional board as senior director at its inception.

The late Mr. E. G. Rowledge

A memorial service was held in St. Aldate's Church, Oxford, on 26th April.

PARLIAMENTARY REPORT

Electricity and National Parks

Earl Jellicoe told the House of Lords last week that it was the Government's policy to allow the siting of power stations in national parks and areas of outstanding natural beauty only when the Ministers of Power and of Housing and Local Government were quite certain that suitable sites elsewhere could not be found. While "undergrounding" remained so much more costly, it had to be expected that overhead lines would have to be used for the supergrid lines.

"For the time being we must rely on the earliest possible consultation between local authorities, including, of course, the park planning committees, and the Electricity Boards, aimed at helping the Boards to find the least obtrusive routes," he said.

The Parks Commission's 11th report had shown that Electricity Boards had made concessions to amenity by altering line routes, or varying sections of them, especially the lower-voltage distribution lines, though there might well be room for improvement. An indication of the Government's attitude in the matter had been the recent decision to refuse consent to three miles of 275 kV line between Elstree and Mill Hill.

Lord Silkin, who initiated the debate, said that overhead electricity mains were often seriously damaging to scenic beauty. "While nobody would be as unreasonable as to require the Boards always to put their wires underground, whatever the cost, I would suggest it is most improper of them to take the view that whatever the National Parks Commission may say, if the planning authority insist on having wires underground there will be no electricity for the inhabitants. Even Electricity Boards are not entitled to make a dead letter of an Act of Parliament," he said. This had arisen where the local authority had objected to overhead mains at Whitesands Bay, near St. David's, Pembrokeshire, and asked for a portion of the mains to be put underground. The Electricity Board stated at the subsequent inquiry that if they could not put the wires overhead the inhabitants would have to wait indefinitely for their supply.

The Earl of Feversham said that to preserve the charm of his own remote area he had provided £500 towards the cost of putting underground part of an electricity supply system to tenant farmers. The area was in the very heart of a national park and it was wrong for amenity to be preserved only by the goodwill of a private individual. Electricity authorities should pay more respect to the representations made by the National Parks Commission and local planning committees. There should also be a full investigation into why there was always a delay in supplying farms when efforts were made to take the best route rather than the shortest one.

The Earl of Huntingdon believed it would be disastrous to allow development such as the gigantic atomic power station—three times the size of Winchester Cathedral and with a 600ft high stack—that had been threatened at Newtown in the Isle of Wight.

Cost of Bradwell Station

Mr. J. C. George, Parliamentary Secretary, Ministry of Power, in reply to a question, said that the Bradwell (Essex) nuclear power station, expected to be in full operation by the middle of next year, was likely to cost about £58 million.

INDUSTRIAL NEWS

Dounreay Delay

THE chairman of the United Kingdom Atomic Energy Authority, Sir Roger Makins, stated last week that there had been some delay in running up the Dounreay fast breeder reactor to useful power. The cause was the presence of impurities in the liquid metal coolant. The difficulties were being dealt with and it was expected that they would be overcome by midsummer.

The reactor was shut down for three months last year, in accordance with the programme, for modification to be made to the core to enable trials to be carried out on a wider range of materials. The report that the Dounreay reactor was to be abandoned was "quite unfounded."

The Authority's main effort at present on the fast reactor system was to specify the fuel for a prototype civil power reactor. The Dounreay reactor would be a key tool in the development and testing of this fuel. There was a powerful incentive to solve the technical problems associated with this system.

Nuclear Costs

Sir Roger said the assumptions made in 1956 about costs of nuclear power had turned out to be mostly wrong. The exception was the prediction about the capital and unit costs of nuclear stations and the probable fall in their construction costs. In fact, the present estimate was that the capital cost of civil nuclear power stations had fallen by 38 or 39 per cent in the four years between the start of the first nuclear power station in January, 1957, and the start of the seventh last month.

The estimated cost of electrical generation from these nuclear stations had been falling at about the same rate. All the other economic assumptions—for example the availability of conventional fuels, the development potential of conventional power generation and the rate of interest—were underestimated.

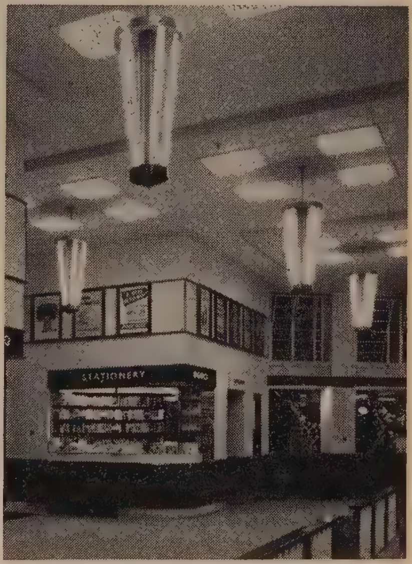
The extra cost to the consumer of nuclear generation when spread over the system was insignificant and a negligible premium for the introduction of a third fuel into the economy.

"There is, I know, a feeling of disenchantment in some parts of industry about atomic energy work. But I venture to say that British industry will in due course reap substantial benefits from its early and practical experience in this new technology."

Sir Roger said that the eight Calder Hall and Chapel Cross reactors, the first of which had now run for over four years, had given very good results and had operated steadily without serious mishap. They had a higher performance in all respects than that for which they were designed.

Coach Station Lighting

Special fluorescent lighting fittings were developed by the Stearn Electric Co., Ltd., for the recent modernisation of the Victoria Coach Station booking hall. These attractive pendant fittings each house five 3ft 30 W tubes which are mounted vertically and at a slight angle. The metalwork is finished in gilt and black. They form the centre-piece of a pattern of recessed modular fittings set in a panelled acoustic ceiling. Counter lighting is provided by fluorescent units which are separately switched. The electrical installation was carried out by Rashleigh Phipps & Co., Ltd., and the architect was Mr. H. A. F. Spooner, L.R.I.B.A.



Pendant fittings in the booking hall of Victoria Coach Station

Recent C.E.G.B. Contracts

CONTRACTS for power stations, transmission lines and transforming stations amounting in the aggregate to approximately £12,742,700 have been placed by the Central Electricity Generating Board during the past month. They include:—

Kearsley power station: Ash handling equipment.—Bennis Combustion.

Thorpe Marsh: One 550 MW reheat turbo-generator and boiler feed pump.—Associated Electrical Industries.

West Burton: Preliminary civil engineering works.—Mitchell Construction Co.

Drakelow "C": Two 400 MVA generator transformers.—A.E.I. 3·3 kV auxiliary switchgear.—A. Reyrolle & Co. Six cooling towers.—Film Cooling Towers (1925). Two 50 MVA 132/11·6 kV station transformers.—Yorkshire Electric Transformer Co.

Bankside: 60 MW turbo-generator set with associated condensing and feed heating plant.—A.E.I.

Tilbury "B": Access roads and sidings, drainage, construction buildings, etc.—Holloway Bros. (London).

West Thurrock: Condensing plant for two 300 MW turbo-generator sets.—Worthington-Simpson.

Barrow main substation: Two 45 MVA transformers. — Johnson & Phillips.

Paignton substation: Two 60 MVA 132/33 kV transformers and auxiliary transformers.—A.E.I.

Whitson substation: Civil works.—A. Jackaman.

Blyth "B" power station: 16 kV and lower voltage cables and accessories.—Pirelli-General Cable Works.

Barking - Brunswick Wharf - West Ham: 132 kV cables.—W. T. Glover & Co.

Cowes: 33 kV cables.—B.I.C.C.

THE E.C.A. CONFERENCE

In our leaderette of 21st April commenting on this year's conference of the Electrical Contractors' Association, which marks the Association's *diamond* jubilee, the venue was inadvertently given as Eastbourne. As will be seen from the notes on the programme on p. 716 of last week's issue, the conference is at Torquay.

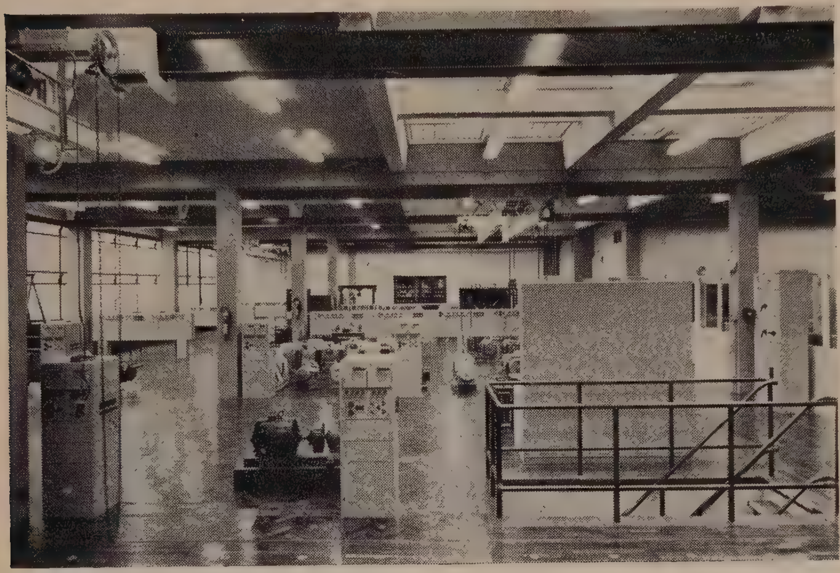
Insulators in South Africa

Pilkington Brothers, Ltd., are to set up, at their sheet glass works in Springs, Transvaal, South Africa, a plant for the production of high voltage toughened glass insulators. Manufacture of a full range of suspension and tension insulators is to start in the autumn. Local raw materials will be used and technical personnel from Britain will train South Africans to operate the plant.

New Laboratories at Imperial College

To provide facilities for double the number of students at the Imperial College of Science and Technology, London, an expansion scheme was inaugurated in 1957 during the College's jubilee year. The scheme includes a new building to accommodate the heavy electrical machine laboratories and departmental workshops for the department of electrical engineering and the central college boiler house. This contract, valued at £422,000, was started in May, 1959, and completed last February.

The architects and engineers for the complete scheme are Messrs. Norman & Dawbarn, and Wates, Ltd., were the building and civil engineering contractors for the new electrical engineering laboratory building. The electrical installation was carried out by T. Clarke & Co., Ltd.



General view of the new heavy electrical machine laboratories at the Imperial College of Science and Technology, London

Production of Wires and Cables

The report of the Census of Production for 1958 Part 57 (H.M. Stationery Office, price 2s) shows that insulated wires and cables were being produced by 71 firms in 101 factories. The value of sales (1954 figures in parentheses) was £151,169,000 (£132,492,000) and of net output £48,412,000 (£37,951,000).

The 42 (50) firms employing more than 25 persons, in 70 (83) factories, accounted for £149,504,000 (£131,032,000) of the total sales and £47,879,000 (£37,533,000) of the net output. They employed 45,419 (47,049) people, of whom 31,298 (33,160) were operatives.

Firms employing 5,000 or more people accounted for £85,415,000 of the total sales and £27,643,000 of the net output. They employed 27,040 people and accounted for £3,386,000 of the industry's capital expenditure of £5,514,000. Their net output per person employed was, at £1,022, slightly below the average of £1,054; the highest level, of £1,436, being achieved by the eleven firms employing between 500 and 749 people.

Of the sales of principal products, which amounted to £128,254,000 (£109,702,000), paper insulated cables were responsible for £33,092,000 (£27,176,000), rubber insulated cables £24,145,000 (£26,557,000), plastics insulated cables £19,927,000 (£8,276,000) and telecommunication cables, including submarine, £18,212,000 (£18,153,000).

PROPOSED NIGERIAN FACTORY

Turner & Newall, Ltd., are to build a factory in the Eastern Region of Nigeria which will provide regular work for 300 Nigerians. The factory is planned to be at Emene, seven miles from Enugu, the capital of the Eastern Region. It will produce, eventually, 17,000 tons of asbestos products a year. A new public company, Turners Asbestos Cement (Nigeria), Ltd., has been formed.

G.E.C. Embark on Cooker Expansion Programme

The Swinton cooker works of the General Electric Co., Ltd., are engaged on the largest cooker output ever undertaken by the company. This, coupled with new production techniques, has enabled the company to reduce cooker prices substantially.

The "Treasure 4" automatic cooker, with four radiant plates, eye-level grill, etc., is reduced from £59 10s to £54 12s and the "Treasure 3" cooker from £52 to £47 5s (with oven timer) and £48 to £44 2s (without oven timer).

Commenting on the expansion programme, Mr. C. F. Richards, of the G.E.C. Domestic Equipment Group, said that this was the forerunner of a new and vigorous production policy, the full effects of which would be increasingly apparent as a major appliance programme unfolded. Reorganisation of the company, well under way, was enabling new techniques to be adapted quickly to their production lines.

MERSEY CABLE WORKS TAKE-OVER

Enfield Rolling Mills, Ltd., Standard Telephones & Cables, Ltd., and Tube Investments, Ltd., have concluded negotiations under which Mersey Cable Works, at present wholly owned by Tube Investments, will transfer its plant, goodwill and business to Enfield-Standard Power Cables, Ltd., from 1st May, in exchange for shares in Enfield-Standard Power Cables. It is intended to continue production at the Mersey Cable Works, and no redundancies are foreseen.

Heating and Ventilating Research

Mr. M. J. Gartside, chairman of the Heating and Ventilating Research Association, presided at the second annual general meeting held recently at Caxton Hall, London. Presenting his report, Mr. N. S. Billington, the director, outlined the policy of research. The Association, he said, was trying to pursue a balanced programme designed to benefit as many members as possible, and to improve the standards of the industry as a whole. The chairman of the Finance and Membership Committee, Mr. I. H. Duff, reported that the number of members had increased by 15 to 275.

With the consent of the Board of Trade, a special resolution was passed, amending the articles of association to permit an increase in the maximum number of elected members of the Council from 21 to 30.

NEW SPACE COMPANY BOARD ELECTED

THE British Space Development Co., Ltd., announces that the following companies have become founder members:—Associated Electrical Industries, Ltd.; Associated Television, Ltd.; British Insulated Callender's Cables, Ltd.; Decca Radar, Ltd.; Hawker Siddeley Aviation, Ltd.; Plessey Co., Ltd.; Pye, Ltd.; Rank Television & General Trust, Ltd.; and Rolls Royce, Ltd.

Sir Robert Renwick, Bt., K.B.E., has been appointed chairman and the following have been elected to the board: Mr. J. R. Brinkley, Group Capt. E. Fennessy, Mr. G. C. I. Gardiner, Mr. A. A. Rubbra and Group Capt. D. Saward.

A technical committee, set up under the chairmanship of Mr. G. K. C. Pardoe, will have the following members: Messrs. D. E. Burchett (A.E.I.), A. V. Cleaver (Rolls Royce), J. M. C. Dukes (Plessey), W. F. Hilton (Hawker Siddeley), W. M. Lloyd (Rank), L. F. Mathews (A.T.V.), K. Milne (Decca Radar), T. P. Blott (Pye) and G. A. Dodd (B.I.C.C.).

The task of the technical committee will be to examine and prepare plans designed to achieve British participation, first in communications.

FULL TIME AT REFRIGERATOR FACTORY

Announcing the resumption of a five-day week at the Peterborough factory of A.E.I.-Hotpoint, Ltd., Mr. R. Craig Wood, the company's chairman, said that the need to build up refrigerator stocks for the coming season meant a return to full time for the 650 workers at the factory who went on a four-day week three months ago.

E.T.U. Action

ON the second day of the High Court action by two members of the Electrical Trades Union, Mr. Gerald Gardiner, Q.C., continued his opening speech for the plaintiffs. The action is being brought by Mr. John Thomas Byrne and Mr. Frank Chapple against Mr. Frank Foulkes (general president, E.T.U.), Mr. Frank L. Haxell (general secretary), 14 other members of the Executive Council and officials of the Union, and the Union, for, *inter alia*, a declaration that the election of Mr. Haxell as general secretary in December, 1959, was contrary to the rules, *ultra vires*, illegal and void and that Mr. Byrne was elected; alternatively that the Union was bound forthwith to hold an election; and damages for conspiracy. On the opening day Mr. Neil Lawson, Q.C., for defendants, said it was not now sought to uphold the validity of the election because of irregularities in the issuing of ballot papers and scrutiny of votes. Defendants, however, denied and contested to the utmost the allegations of conspiracy and fraudulent practices.

Mr. Gardiner said that he had considered the defendants' admission that Mr. Haxell's election was invalid. The position was that since December, 1959, he had been an ordinary member of the Union. Since then, however, there had been an election for the post of assistant general secretary in which the candidates were Mr. R. G. MacLennan and Mr. Chapple. In a Chancery action Mr. Chapple was alleging the same kind of practices as in the election for general secretary, but Mr. MacLennan had been appointed acting assistant general secretary.

Mr. Cecil Keill (secretary, Gilmoss Branch, Liverpool) was the first to give evidence. He said that the quarterly meeting was held on 21st December at which the voting was Byrne 154; Haxell 20. The return was posted at eleven o'clock that evening. Later he was informed that the return had been rejected because it was too late. He was shown an envelope date stamped "Liverpool 1.15 p.m. January 2nd, 1960." That was not his envelope.

Further evidence was given by a number of other branch secretaries.

(*Proceeding*)

Electrical Retailers' Conference

A CONFERENCE on "Premises as a Selling Force" was held by the N.E.C.T.A.., Ltd., on 13th April at the British Lighting Council headquarters in London. Mr. H. F. Truman, chairman of the N.E.C.T.A. Retailers' Committee, presided and the conference was opened by Mr. C. J. Veness, vice-president, who stressed the importance attached by the N.E.C.T.A. Council to the proper approach to the problem of retailing.

Mr. Denis Jones, the Association's sales training officer, discussed "Creating a Buying Atmosphere" and said that the retailer could not win customers with dingy and out-of-date premises. They must be planned to place no barrier, physical or psychological, between the customer and the goods. Mr. J. T. Seago (Courtney, Pope (Electrical), Ltd.) spoke on "Planning or Re-planning the Shop" and illustrated his talk with pictures of shops before, during and after modernisation.

Mr. A. D. Charters (British Lighting Council) dealt with "Lighting and Selling" from the shopkeeper's point of view. He discussed lighting both for general and special purposes, to ensure that what the shopkeeper wanted to sell could be readily seen. The electrical contractor and retailer should set a lead in lighting his premises, so that he was consulted not only by the public but also by other shopkeepers who saw his displays. Lighting could be used to get business as well as to sell goods.

At the N.E.C.T.A. "Premises as a Selling Force" Conference. Left to right: Mr. Denis Jones (N.E.C.T.A. sales training officer); Mr. W. J. Jones (director, British Lighting Council); Mr. C. J. Veness (N.E.C.T.A. vice-president); Mr. H. F. Truman (chairman, N.E.C.T.A. Retailers' Committee); Mr. A. D. Charters (British Lighting Council); and Mr. J. T. Seago (Courtney, Pope (Electrical), Ltd.)

INDUSTRIAL NEWS *[continued*

Thorn House Sculpture Illuminated

BELIEVED to be the largest of its kind in England, the new bronze abstract sculpture which was recently placed in position on the east wall of Thorn House, the London headquarters of Thorn Electrical Industries, Ltd., was officially installed last week.

The sculpture, which weighs more than six tons, is the work of Mr. Geoffrey Clarke, developed from a study of electric lamp filaments, the form of the sculpture being an abstract extension of the visual appearance of an illuminated filament and its shafts of light.

The planning of the built-in lighting was carried out jointly by Mr. Clarke and Mr. Richard Stevens (chief designer, Atlas Lighting, Ltd.). To overcome the difficulties of illuminating an exposed feature of this sort, the lamps are on a 12 V supply, a step-down transformer being sited within the building. A central feeder cable runs through the wall support and connects to a busbar on the back of the shield section, leads then being taken off to the various lamps with an earth return through the sculpture itself. Four 50 W low-voltage spotlights in the base of the shield and adjacent to the "spear" are directed upwards to provide the main illumination. Low wattage lamps are mainly used in the rest of the sculpture.

A new London landmark—the sculpture on the wall of Thorn House

Transformers for U.S. Power Project

Six power transformers valued at more than $200,000 have been supplied by Crompton Parkinson, Ltd., for the Fremont Canyon power project in Wyoming, U.S.A., the completion of which will be celebrated on 30th April.

"EMPRESS OF CANADA"

In the account of the electrical installation in the new Canadian Pacific liner s.s. *Empress of Canada* published in the 14th April issue of the *Electrical Review*, Johnson & Phillips, Ltd., were omitted from the list of electrical equipment suppliers. This company manufactured some 170 miles of butyl rubber insulated cables for the ship's electrical distribution system.

NEW SCOTTISH POWER STATION

The South of Scotland Electricity Board have appointed Kennedy & Donkin to be consulting engineers for their £50 million Lothian power station which will have a capacity of 1,200 MW. Kennedy & Donkin will be assisted by James Williamson & Partners and Strain & Robertson.

Output Rise Slackens

MARCH was the second month in which only a modest increase was recorded in the electricity output figures issued by the Ministry of Power, causing the rate for the first quarter of the year to contract to 5·3 per cent. As in February, however, the comparison with 1960 was disturbed by changes in the calendar; in this case the Easter holidays. The corrected figure for electricity sales to Area Boards is given by the Electricity Council as 9·1 per cent, when adjusted for the number of working days and weather conditions, whereas the actual rise was only 1 per cent. Half of the Area Boards, in fact, reported decreases. The best figures for England and Wales were those of the Yorkshire and Merseyside & North Wales Boards, both with a rise of 4·7 per cent, but this rate was exceeded by the South of Scotland Board with 4·9 per cent.

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capacity MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.... ...	4,266	76	516·9	10,315	6	10,330	9,709	27,067
North of Scotland H.E.B. ...	1	—	1·5	1	264	272	271	1,045
South of Scotland E.B.	310	2	0·6	614	20	634	598	1,763
Total for March, 1961	4,577	78	519·0	10,930	290	11,236*	10,578	29,875
Corres. total for March, 1960 ...	4,634	99	469·9	10,756	253	11,023	10,390	28,301
Inc. or dec., per cent	−1·2	−20·9	+10·4	+1·6	+14·5	+1·9	+1·8	+5·6
Total to date (3 months), 1961...	14,966	239	1,577·9	34,605	877	35,536	33,488	
Total for corres. 3 months of 1960	14,315	294	1,412·9	32,843	864	33,752	31,828	
Inc. or dec., per cent	+4·5	−18·6	+11·7	+5·4	+1·4	+5·3	+5·2	

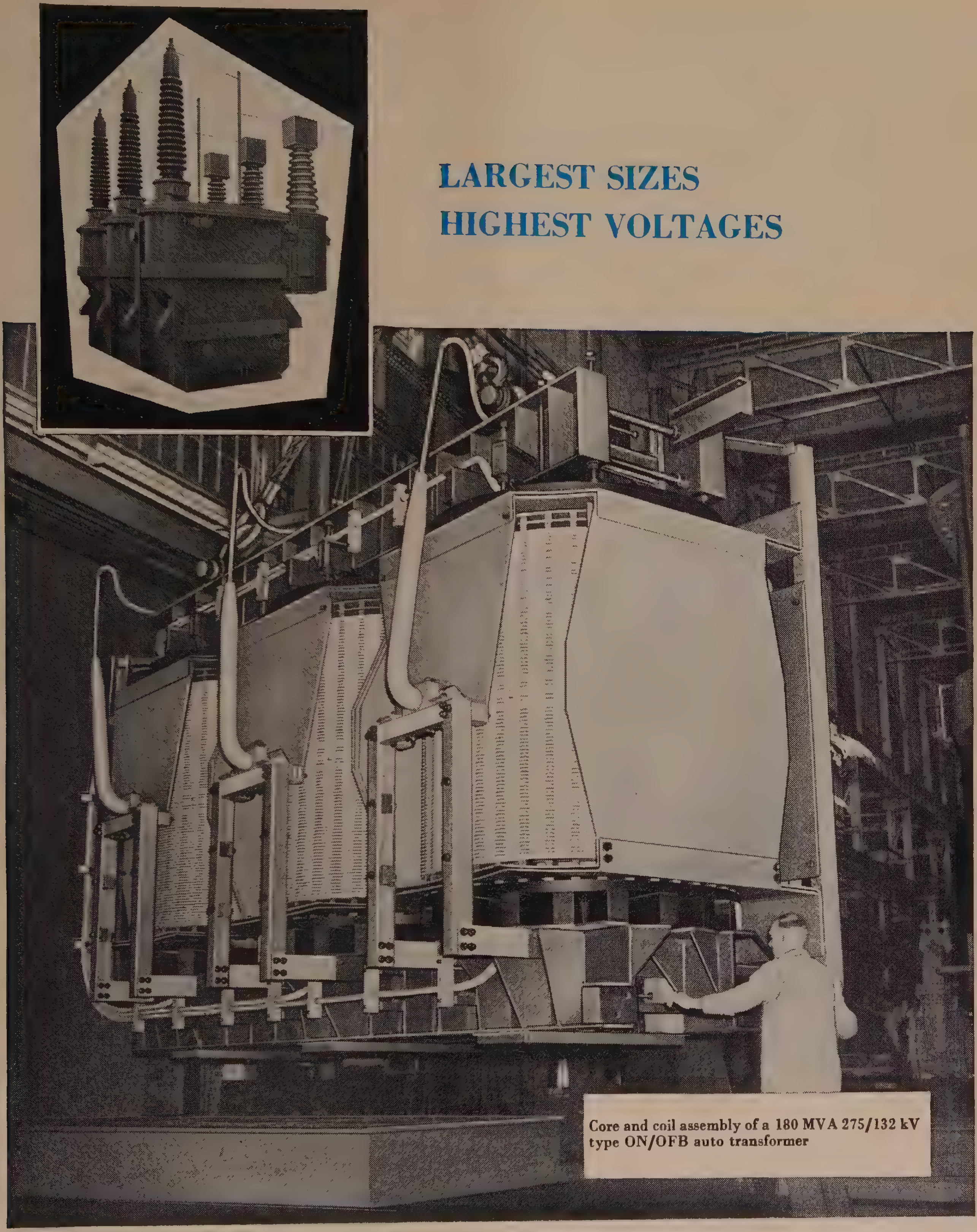
* The total figure includes generation by other methods amounting to 16 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for March (million kWh)			Twelve Months' Totals Ended 31st March (million kWh)		
	1960	1961	Inc. or Dec. %	1960	1961	Inc. or Dec. %
London	890·9	858·4	−3·6	8,298·6	9,078·2	+ 9·4
South Eastern	589·6	596·2	+1·1	5,767·2	6,455·2	+11·9
Southern	787·1	783·9	−0·4	7,577·2	8,645·8	+14·1
South Western	357·9	363·6	+1·6	3,565·6	3,959·1	+11·0
Eastern	950·2	948·2	−0·2	9,168·9	10,252·8	+11·8
East Midlands*	774·4	773·4	−0·1	7,669·7	8,467·6	+10·4
Midlands*	1,043·6	1,040·2	−0·3	10,112·3	11,161·7	+10·4
South Wales*	535·0	556·9	+4·1	5,615·2	6,095·3	+ 8·6
Merseyside and N. Wales* ...	581·7	608·8	+4·7	5,948·8	6,582·5	+10·6
Yorkshire*	1,003·2	1,050·8	+4·7	9,777·6	11,195·1	+14·5
North Eastern*	563·8	557·8	−1·1	5,650·0	6,238·0	+10·4
North Western*	987·2	1,015·1	+2·8	9,831·1	10,970·6	+11·6
Total all Area Boards	9,064·6	9,153·3	+0·6	88,982·2	99,101·9	+11·3
Direct Supplies by C.E.G.B. ...	323·6	330·2	+2·0	3,592·9	3,785·3	+ 5·4
Grand Total	9,388·2	9,483·5	+1·0	92,575·1	102,887·2	+11·1
Mainly Industrial Areas*	5,488·9	5,603·0	+2·0	54,604·7	60,710·8	+11·1
Mainly Non-Industrial Areas ...	3,575·7	3,550·3	−0·7	34,377·5	38,391·1	+11·7
South of Scotland E.B.	755·9	792·7	+4·9	7,381·9	8,233·3	+11·5
North of Scotland H.E.B. ...	170·6	174·3	+2·2	1,665·7	1,619·7	− 2·8

* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year

LARGEST SIZES
HIGHEST VOLTAGES

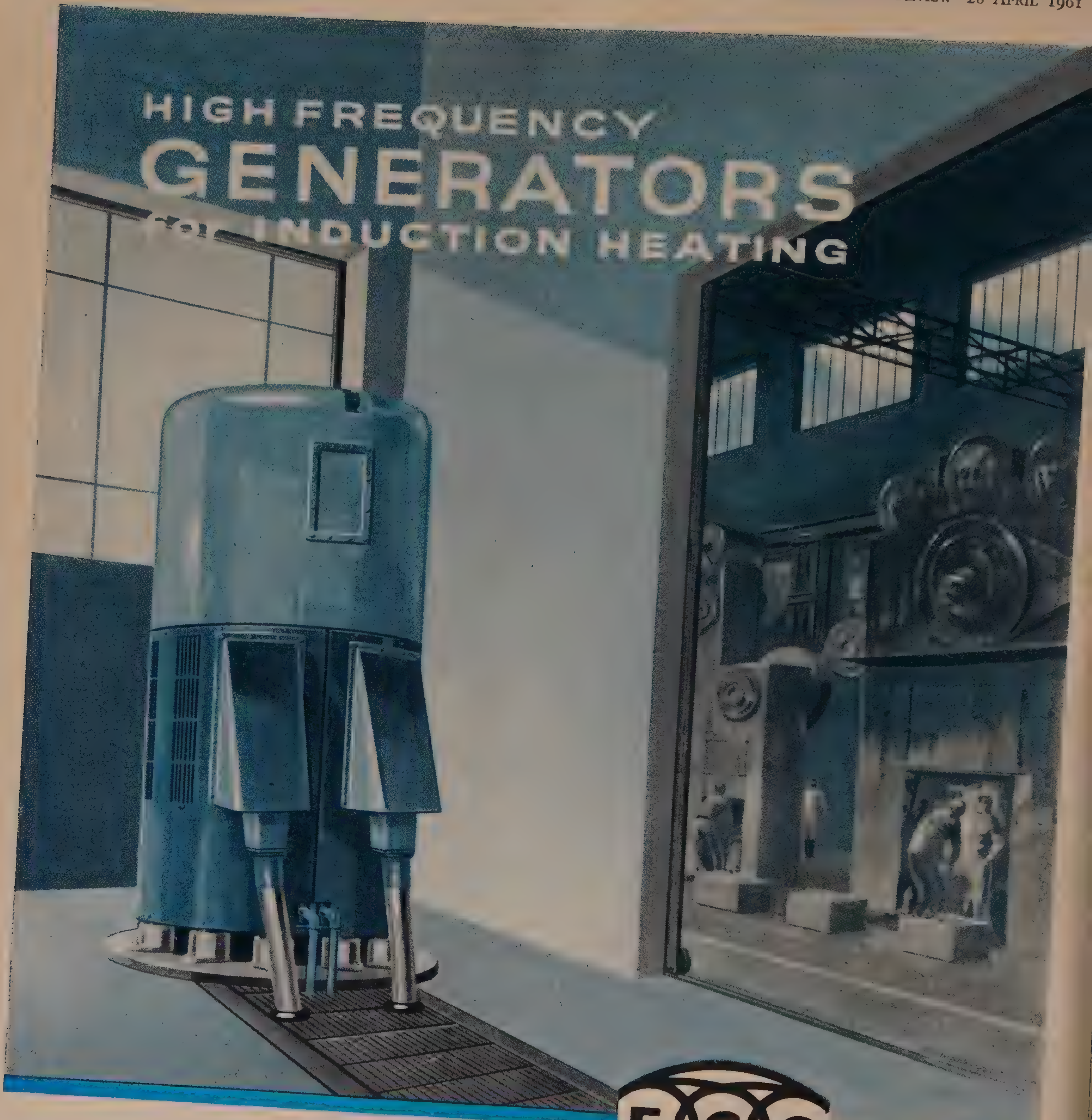


Core and coil assembly of a 180 MVA 275/132 kV type ON/OFB auto transformer

HACKBRIDGE TRANSFORMERS

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD.

HERSHAM · WALTON-ON-THAMES · SURREY Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: Electric Walton-on-Thames



ECC

WOLVERHAMPTON

BROCHURE
B2270/AC320
GIVES DETAILS

OBTAINABLE FROM YOUR—
NEAREST E.C.C. AREA OFFICES
OR DIRECT FROM THE WORKS

USKMOUTH "B" PRECIPITATORS

THE three 120 MW units at Uskmouth "B" generating station incorporate six Sturtevant electrostatic precipitators with mechanical collectors, designed to give an overall efficiency of 98·5 per cent with the boiler operating at maximum continuous rating and resulting in a flue gas burden to the chimneys of 0·067 grains per cu ft at N.T.P. on the design fuel.

The interesting feature of this installation is that the Howden mechanical collectors are completely integrated with the precipitators resulting in a considerable saving of space. A lagged steel flue runs the length of the precipitator casings and is designed to feed gases at the correct speed to the primary cells of the mechanical collector. Primary collectors built into the casing wall are positioned to give the best possible gas distribution to the tubular collecting electrodes. After entering the treatment chamber the gases pass upwards through the tubes and come under the influence of the electric field formed between the wire discharge electrodes and the tubular collecting electrodes. It is impossible for any of the gas to by-pass the treatment zone.

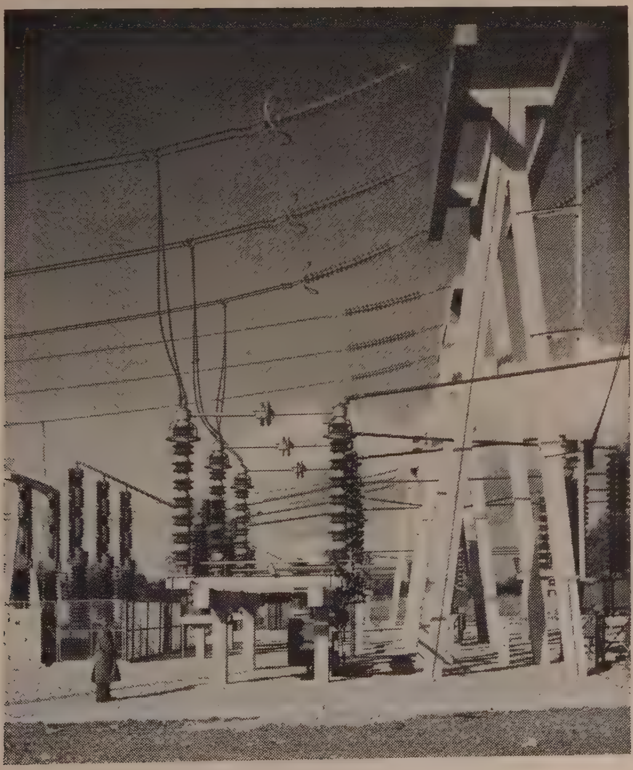
The discharge electrode system is rapped by cam-operated falling hammers, situated on shafts coupled to a constant speed motor with reduction gear. The tubular receiving electrodes are rapped by a number of hammers lifted and released mechanically.

There is one high-tension set with a mechanical rectifier to each precipitator, and two h.t. sets are provided per boiler in a common high-tension house. The sets are interconnected on the output side so that either precipitator may be shut down for routine cleaning and maintenance. Rapping control panels are provided in the h.t. house for discharge and collecting rapping gear, and booster fan motors.

To accomplish and maintain stability during changing boiler conditions, and to provide maximum efficiency in performance, an automatic supervisory control panel system has been incorporated in the high-tension equipment. This is devised to relieve the control room staff of much of the responsibility of operating the precipitators at the maximum performance. Remote control equipment is also provided on the boiler panels allowing operation of the precipitators and mechanical collectors from the boiler control room.

Supergrid Switching Station

THE 275 kV supergrid switching station at Feckenham, Worcestershire, in the Midlands Division of the Central Electricity Generating Board, has been equipped by the English Electric Co., Ltd., with air-blast circuit-breakers having a breaking capacity of 7,500 MVA. The company has recently received an order to extend the station with new breakers rated at 15,000 MVA. In the centre of the accompanying photograph is a three-phase 2,000 A isolator and earthing switch designed for a throughput of 15,000 MVA at 275 kV. The isolator was manufactured by English Electric at its Stafford Works to a joint design by English Electric, G.E.C. and A.E.I. At the left is one of the 7,500 MVA air-blast circuit-breakers.



Feckenham 275 kV switching station

Back-Pressure Plant for Large Board Mill

An order has been received by W. H. Allen, Sons & Co., Ltd., from Thames Board Mills, Ltd., Purfleet, Essex, for a 10·5 MW pass-out back-pressure turbo-alternator set. The machine will be designed to operate with steam at 600 p.s.i.g. and 740°F, passing out up to 120 klb/hr of process steam at 55 p.s.i.g. with an equal quantity available at an exhaust pressure of 21 p.s.i.g. under conditions of reduced pass-out flow.

The Allen turbine will run at 3,000 r.p.m. and drive directly an English Electric water-cooled alternator supplying power in parallel with existing plant for an 11 kV, 50 c/s supply at 0·8 power factor.

RUSSIAN PUMPED STORAGE SCHEME

The first Soviet pumped storage scheme has been designed by Moscow power engineers. With a capacity of 585 MW, it will be built to the north of Moscow in the area of Zagorsk, on the River Kunia.

A lower basin will be built on the river and there will be a 14 million cubic metre artificial lake on one of its banks. Eleven million cubic metres of water will constantly circulate there and back. The drop between the two basins will be more than 300ft.

Equipment for Polish Floating Dock

A floating dock with a lifting capacity of 5,500 tons has been ordered from the Furness Shipbuilding Co., Ltd., for the United Ship Repair Yards at Gdansk, Poland. It is to be equipped with four 22in de-watering pumps and two fire pumps and exhausters manufactured by Gwynnes Pumps, Ltd., with electric motors and control gear supplied by W. H. Allen, Sons & Co., Ltd.

Electronic Seat Reservation System

A CONTRACT has been placed by the British Overseas Airways Corporation with Standard Telephones & Cables, Ltd., for the supply and installation of an electronic system which will provide ticket selling offices throughout the U.K. and Europe with information on the availability of airline seats on all flights operated by B.O.A.C. The system will also give information on the flights of other airlines associated with B.O.A.C.; in each case the information will be available for flights over a period up to 20 weeks ahead. Initially, a central magnetic drum store of flight information in the Airways Terminal, Buckingham Palace Road, London, will serve about 100 sales personnel using special keying sets within the building. Later, the system will be extended, using telegraph circuits, to various points in London, and further geographical extensions over standard telegraph channels will be made to cities in the United Kingdom and Europe.

Each sales clerk within the system has access to a push-button unit for interrogating the computer store. A set of "flight plates," which are thin metal plates with standard flight information printed on both sides, are supplied periodically from the control centre and show the pattern of flight information for twenty weeks ahead. One of these is inserted into the desk unit and notches in the plate operate micro-switches in the unit and identify the plate and the side which is being studied. Buttons on the clerk's desk unit corresponding to the departure and arrival points on the sector of the route in question, also to the date and class for which a booking is required, are pressed.

An "Ask" button is then pressed which sends this interrogation code to the central processing equipment. The information store can indicate one of three conditions for each flight on the flight plate: "open for sale," "request" (i.e. where limited seats only are available) and "waiting list." These replies show up as a pattern of lamps on the clerk's unit as green, red/green together, or red, respectively. A fourth condition where no lamps are lit indicates that the flight for various reasons is not available for sale. The availability status of up to 10 flights per interrogation on a given plate can be brought up for consideration by the clerk simultaneously.

Control clerk's key set with a "flight plate" in position

Control clerks in the Airways Terminal are responsible for keeping the status information for all flights up to date in the magnetic drum information store, using a key set similar to that of the sales clerk but with additional buttons for feeding the drum of the information store with "coloured light" status on any or all of the flights on any flight plate. The supervisor's console contains keys which enable him to initiate any of 12 different computer programmes. These include those initiated by the sales and control clerks, the automatic daily updating of availability information as each day's flights become redundant, the storage of address and "open for sale" condition when new flights are included, and verification procedures for checking the positions and alignment of information on the drum store.

Two drums constitute the information store, each having 1,000 bit positions on 320 tracks. The central processor has been designed to handle 8,000 interrogations per hour.

TRANSISTOR DATA MANUAL

The "International Transistor Data Manual," edited by C. E. Bull and published by Avo, Limited, Avocet House, 92, Vauxhall Bridge Road, S.W.1 (price 35s), provides information on approximately 3,000 transistors and includes obsolete, obsolescent, current production and prototype patterns. Data from 90 transistor manufacturers and distributors is listed, including American, European, Japanese, Australian and East European. In addition, information is given on transistors having Services Common Valve (CV) specifications.

THIRD 300 MW SET FOR WEST THURROCK

THE Central Electricity Generating Board has ordered a third 300 MW turbo-generator from Associated Electrical Industries, Ltd., for West Thurrock power station. The order is worth £2·3 million. Two similar machines are already being made by A.E.I. for this station. Delivery of the third set is scheduled for 1964. It will have a single-axis, tandem-compound re-heat turbine with a multi-exhaust stage in each of four exhaust flows. Initial steam conditions will be 2,300 p.s.i.g. and 1,050°F with reheat to 1,050°F. It will exhaust at 1·1in Hg. The generator will be hydrogen cooled with direct water-cooling of the stator winding. The terminal conditions will be 353 MVA, 0·8 p.f., 18·5 kV, 3-phase 50 c/s.

Television Relay Service

Last week Lord Provost M. McManus, J.P., inaugurated a television relay service provided by North British Relay, Ltd., in Dundee. The opening ceremony was performed in the new 8,000 sq ft building erected by the company at Camperdown Road.

CONTROL EQUIPMENT FOR SOUTH AFRICAN FACTORY

An order has been received by Brookhirst Igranic, Ltd., for control equipment for a new factory for the production of titanium dioxide which has been engineered by W. J. Fraser, of Romford, and is being erected by South African Titan Products. The services to be controlled are fans, conveyors, elevators, pumps and agitators. The assembly of the control equipments is being undertaken by Brookhirst Igranic S.A. (Pty.), Ltd., of Johannesburg.

VOLTAGE REGULATOR EXPORT ORDER

Brentford Transformers, Ltd., have received an order worth nearly £50,000 from the Pakistan Government for 200 automatic voltage regulators.

Domestic Appliance Sales

Sales of cookers, refrigerators and immersion heaters showed an improvement in February, compared with the previous month, according to the latest return issued by the Electricity Council. The number of refrigerators sold remained at about the same level, but there was a sharp fall in demand for clothes dryers. The return, of course, is confined to sales by Area Electricity Boards, which represent only a part of the total throughout the country.

Appliance	Month ended 28th February		Twelve months ended 28th February	
	Total	Change %	Total	Change %
Cookers ...	26,643	− 2·6	340,409	—
WaterHeaters:				
Immersion	11,001	+22·5	196,019	+ 3·0
Storage ...	4,940	− 9·2	66,793	+ 7·8
Wash Boilers	4,474	− 9·2	55,640	−15·3
Washing Machines ...	9,357	−21·8	104,542	−34·6
Refrigerators	6,493	+21·7	142,527	−15·0
Clothes Dryers	4,608	−35·5	52,706	n.a.

TRADE ANNOUNCEMENTS

The Servicing Department of **Cossor Radar & Electronics, Ltd.**, at West Norwood, London, S.E.27, was severely damaged by fire on 16th April and the work of this department has been transferred to the company's Equipment Servicing Department, Edinburgh Place, Temple Fields, Harlow, Essex (telephone: Harlow 25537).

A reorganisation of their sales territories is announced by **Geo. Bray & Co., Ltd.** The Sales Division, under Mr. John W. Tidswell, general sales manager, is divided into three groups: Technical sales, under Mr. Arthur Coates; commercial sales, under Mr. E. Cawood; and the new U.K. sales territories and representatives controlled by Mr. D. Gowans (London, Mr. W. H. Scott; Southern Counties, Mr. A. Morton; South Western Counties, Mr. G. Brown; Eastern Counties, Mr. G. A. Atkinson; Wales and the West, Mr. S. Bradbury; Yorks. and Lancs. and Ireland, Mr. G. N. Milner; and Scotland and Northern Counties, Mr. T. Fraser).

Overseas, Mr. R. Wischet will cover the southern part of Western Germany, part of Eastern Germany and Austria from 1st July and Mr. Englehardt will take over the northern part of Western Germany and the remainder of Eastern Germany. Mr. T. P. Schofield will represent the company in South Western Europe.

Mr. N. A. C. James, Southern England area manager, **Cape Insulation & Asbestos Products, Ltd.**, has been appointed controller, Government Contracts Division, a new post. Mr. N. H. Wimhurst becomes the new area manager.

Opperman Gears, Ltd., Newbury, have formed a new company, L.S.A. (Exports), Ltd., a subsidiary of Opperman Gears (Holdings), Ltd., which will operate from offices in Hambridge Road, Newbury. In addition to handling exports within the Opperman Group, the new company offers services to other concerns in the area who may not have the facilities for handling their own export/import arrangements. Mr. Peter Bollen is managing director of the new company.

Welwyn Electric, Ltd., Bedlington, Northumberland, and the Overseas Corporation (Australia), Ltd., have formed a jointly owned subsidiary, Welwyn Electric (Aust.) Pty., Ltd. The new company will have its headquarters in Melbourne and offices in Sydney and Adelaide. It will handle all products manufactured by Welwyn Electric in Great Britain, and is already considering plans for production in Australia.

Mr. M. D. Lippold has been appointed Southern Area manager for the **Benjamin Electric, Ltd.**

Lighting Exhibition at Harrogate

The following members of the Decorative Lighting Manufacturers' Association are organising an exhibition at the Old Swan Hotel, Harrogate, from 29th May to 1st June to show their new autumn collection:—Bellhouse & Binney, Ltd., Chas. F. Bristol & Son, Ltd., Dekor Developments, Ltd., Elliott & Spear, Ltd., E. T. D., Ltd., Hiscock, Appleby & Co., Ltd., Oswald Hollman, Ltd., Interdec, Ltd., Knightshades, Ltd., and Speights, Ltd. The Association hopes that this exhibition will in due course become established as an annual event.

Berry's West Country Depot

A NEW West Country depot has recently been opened at Exeter by Berry's Electric, Ltd. The entrance hall, decorated in a fresh contemporary colour scheme, is hung with portrait studies of the company's three chairmen—H. H. Berry, the founder, Tim Berry, his elder son, and Raymond Berry, who became chairman in 1944.

Last year the company's old premises in South Street handled ten times the volume of business which originally went through the branch when it opened soon after the war. Even so, it was considered quite inadequate to cope with the anticipated future demand and the new premises have been laid out to give six times the storage space, plus large offices, packing bays and service facilities.

In order to make the fullest use of facilities offered, it has been decided to devote the building entirely to storage and service, a showroom being considered to some extent a duplication of the work of dealers' shops and electricity service centres.

The address is Berry's Electric Magicoal, Ltd., Trusham Road, Marsh Barton Trading Estate, Exeter (telephone: Exeter 76424). Mr. P. M. Kenward is the branch manager.

Entrance hall of Berry's new West Country depot

NEW ELECTRICAL EQUIPMENT

CUT-OFF LANTERN

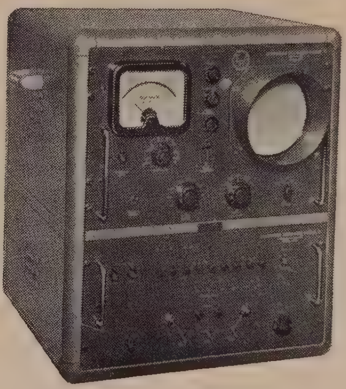
A street lighting lantern having a cut-off distribution in accordance with the B.S. Code of Practice has been introduced by the **General Electric Co., Ltd.**, Magnet House, Kingsway, London, W.C.2. The lantern was developed by the G.E.C. Research Laboratories in conjunction with the Birmingham Corporation for the lighting of the city's new traffic routes. It is constructed in die-cast and pressed aluminium, with a specially designed optical system for use with either the 250 W or 400 W Osram colour corrected mercury lamps. Each side of the lantern body forms a long curved reflector giving the necessary cross-over distribution, and the ends and top of the body have special facings to redirect the light in the upper hemisphere down to the road surface. For maintenance the whole of the lantern body hinges downwards to reveal the lamp assembly.

G.E.C. cut-off street lighting lantern

DISCHARGE DETECTOR

The discharge detector was originally developed by the Electrical Research Association for testing the insulation of high-voltage power system equipment. Earlier models gave a sensitivity approaching the maximum available on specimens up to about 0·1 μF in capacitance, and had a resolution of 35 discharges per quarter wave when testing at 50 c/s. In the model III announced by **F. C. Robinson & Partners, Ltd.**, Councillor Lane, Cheadle, Cheshire, a corresponding sensitivity is attained over the whole of the capacitance range from 6 pF to 250 μF. Beyond the ends of this range, tests may be made at reduced sensitivity. The resolution has been increased to 150 discharges per quarter wave when testing at 50 c/s, and a number of extra facilities have been incorporated. These include the provision of means for distinguishing between discharges occurring in the specimen under test and those occurring in its terminations (such as, for example, stress-relief cones employed in testing cables, or guard electrodes used in testing samples of sheet insulation).

Discharges are displayed individually on the face of a high-resolution cathode-ray tube, and facilities are provided for measuring the magnitude of any observed discharge by injecting a calibration step-wave of known magnitude into the test circuit. The positions of discharges on the test waveform may be located by the use of test-voltage peak markers and facilities to rotate the calibration pulse or the complete display through 360° in steps of 15°.



Robinson model III E.R.A. discharge detector

M.E.I. "Hotfoil" flat element heating tape

The single-phase test voltage is normally derived from the mains, and applied, via a regulator, a filter and a discharge-free transformer, to the test circuit, which consists of the specimen, blocking capacitor and the matching unit. The burden on the mains is limited to a maximum of 5 kVA, a reactor being provided, if required, to supply reactive volt-amps up to 55 kVAr.

The test voltage is measured directly by a rectifier moving-coil meter and series capacitor. For specimens having capacitances up to approximately 100 pF, the voltmeter capacitor, with a suitable attachment, may serve at the same time as blocking capacitor.

SEAM-WELDING BLANKS

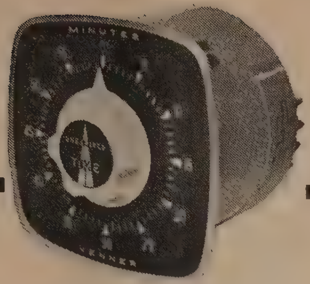
A wider range of rough-machined seam-welding wheel blanks in Mallory 3 can now be supplied from stock by **Johnson, Matthey & Co., Ltd.** In the interests of international standardisation, the blanks are now available in metric sizes, as recommended in B.S. 3067. The new range includes all the commonly used sizes listed in the specification, and the metric sizes are very close to the superseded inch sizes. Details of the new range are given in leaflet 7200/3, "Resistance Welding Electrode Materials," obtainable on request to the company, at 73-83, Hatton Garden, London, E.C.1.

HEATING TAPES

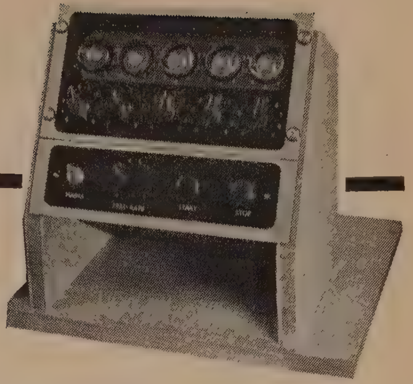
Three types of electrical surface heating tapes have recently been marketed by the **Midland Electric Installation Co., Ltd.**, Cyprus Works, Upper Villiers Street, Wolverhampton, Staffs. In these "Hotfoil" tapes a number of thin metal foil elements—six in a 1in tape—are laid side by side within a strip of insulating material.

The type A tape is for heating up to 110°C and is insulated with a high temperature polyester plastic material. Available with ratings up to 3 W per sq in, it is 1in wide and 0·012in thick and can be wound round pipes or containers of any radius above ¼in. The tapes terminate in silicon elastomer mouldings with 2ft of flexible connecting lead.

The type E tape is also for heating to 110°C and is similar but has an additional woven-glass protective covering. It is 1¼in wide by $\frac{1}{32}$in thick. Both these tapes are available in standard lengths from 12 to 100ft, giving a total rating up to 3 kW.



Venner type PT5 automatic reset timer



Right: Pentechnique batch counter

The type G tape is for heating up to 450°C. This is triple woven-glass insulated and is rated at up to 15 W per sq in. It is available in standard lengths from 6 to 70ft with a total rating up to 3·5 kW. For ratings from 4 to 35 W per ft run the tape dimensions are 1½in wide by 0·06in thick, while from 50 to 80 W/ft run it is 1in wide by 0·06in thick. The standard tapes operate from a 230-250 V supply but special tapes for other voltages can be supplied.

PHOTO-ELECTRIC DETECTOR

The fully transistorised photo-electric detector type CF69A announced by CABLEFORM, LTD., Romiley, Ches., consists of a control box complete with cable glands and cable and containing the transistorised control unit, projector head and detector head. The control box measures 6in by 6in by 3in. It can be operated from a 200/250 V a.c. supply or from a 12 or 24 V battery. Consumption is about 0·3 W. The d.c. supply to the transistor circuit is stabilised against mains voltage variations up to ±10 per cent. The projector head comprises a casing with adjustable lens carrier for focusing. Mounting is by two swivel brackets which allow for vertical or lateral alignment. A 24 V lamp is used with a guaranteed life of 5,000 hr, rated at 3 W with beam lengths up to 6ft and 5 W with beam lengths from 6 to 20ft. Up to four detector heads may be used with a single unit.

It is possible to detect objects with a minimum width of 0·010in at any position along a beam up to 4ft long. With a beam length from 10 to 20ft the minimum object width for detection is 0·025in.

AUTOMATIC RESET TIMER

The latest addition to the range of time switches and process timers manufactured by VENNER, LTD., Kingston By-Pass, New Malden, Surrey, is the type PT5 electrically operated automatic reset timer. In this synchronous motor-driven timer the motor and operating contacts are brought out to separate terminals on a multi-way terminal block arranged in a semi-circle at the end of the cylindrical casing. By making the appropriate connections to this terminal block, the timer may be used with equal facility as a delay relay, recycling process controller, or single operation process timer.

A pair of contacts which close momentarily at the end of the cycle may be connected to initiate a second timer, enabling a group of timers to be interconnected to control a number of processes in a preset sequence. All contacts are rated at 10 A up to 250 V or 5 A up to 500 V a.c., the timer being available for operation on the usual commercial supply voltages and frequencies.

BATCH COUNTERS

Compact batch counters with two, three, four or five dekatron tubes are the latest developments in the range of counting units manufactured by PENTECHNIQUE, LTD., Imperial Lane, Cheltenham, Glos. Capable of batching numbers up to 99,999 at rates up to 5,000/sec, the units can be fed from photo-electric or magnetic pick-ups. The lower sections of the units can have controls and circuitry specifically designed for the type of feed equipment to be used and the batch output signal can be in the form of relay contact closure or electrical signal.

The illustration shows a five-dekatron counter for use with a vibratory bowl feeder and photo-electric pick-up. All controls, including those for the bowl feeder, are grouped on the lower panel. The "Start" button resets the dekatrons to zero to initiate the process and if, for any reason, the resetting is faulty the bowl feeder will not be energised. If, during a count, it is required to stop the bowl feeder, the "Stop" button can be pressed—subsequent operation of the "Start" button will not reset the dekatrons but will allow the count to continue. Basic prices for the counters range from £65 to £125, depending upon the number of dekatron stages and the control circuitry needed.

PROTECTIVE RELAY

A thermal overload and anti-single-phasing relay which covers in a single instrument the range 0·4-50 A is the latest addition to the "Enbray" range of protective equipment made by E. N. BRAY, LTD., Control Gear Works, Britannia Road, Waltham Cross, Herts. Known as the type 8T130, it measures only 3⅝in by 3⅝in by 2⅝in and is fitted to and removed from a 4in long steel fixing channel by snap-action. The relay terminals are of the clamp type and take cables up to 19/·064.

The tripping mechanism is operated by bi-metal strips, which in turn are actuated by the heaters. The relay can be set by a large calibrated dial to trip at any of six settings from 100 per cent to 150 per cent of the rating shown on the plate of the particular heaters in use. It incorporates inherent single-phasing protection, which is independent of the dial setting, and automatic ambient temperature compensation. Three heaters of the required rating are included with each relay, the price being £3 18s. Additional heaters are supplied in sets of three in a protective box with fitting instructions, for 18s.

ALUMINIUM SOLDER

The low temperature solder known as "Tin-a-lum" announced by INDUSTRIAL SYNTHETICS (OVERSEAS), LTD., 64-66, Marlborough Grove, London, S.E.1, enables joints in aluminium and aluminium alloys to be made at ordinary soldering temperatures. No flux is required when used with aluminium and its alloys, duralumin, pewter, tin and magnesium castings. It can be used equally well on copper, brass, ferrous metals and castings with the aid of normally applied fluxes.

The solder is manufactured in sticks approximately 11½in long and no flux core is incorporated. The material starts to melt at a temperature of 180°C and the normal working temperature is 210°C. The normal reheating temperature to break a soldered joint is 350°C although this can be increased if desired by varying the constituents of the solder during manufacture. Laboratory tests on tensile strength have shown that joints using this material can withstand loads up to 26,880 p.s.i.

When used for jointing cables or conductors the joint is said to have a conductivity value equivalent to that of the original conductor.

VALVE VOLTMETER

Taylor valve voltmeter model 172A

The portable valve voltmeter, model 172A, announced by **Taylor Electrical Instruments, Ltd.**, Montrose Avenue, Slough, Bucks., has an input impedance of 11 MΩ on all d.c. voltage ranges, and 830 kΩ to 1·5 MΩ on a.c. voltage ranges. It can be used at frequencies of over 200 Mc/s in conjunction with a small crystal probe. The instrument is portable, weighing only 5½ lb and having outside measurements of 7½in by 6¼in by 4½in. There are seven d.c. voltage ranges from 0-1·5 to 0-1,500 V, seven a.c. r.m.s. voltage ranges up to 1,500 V, seven a.c. peak-to-peak voltage ranges up to 4,200 V, and seven resistance ranges from 0-1,000 Ω to 0-1,000 MΩ.

The meter incorporates a 200 μA centre pole meter capable of withstanding overloads of up to 10,000 per cent without damage. Overload protection is also provided for the meter movement by the limiting effect of the incorporated electronic circuit. The centre pole movement is inherently shielded and is not affected by the proximity of r.f., magnetic fields or other components. Measurements are made on a 5in scale calibrated in three colours which simplifies the location of ranges. A compartment is incorporated for the battery which is accessible from the rear of the case. The instrument is also designed to operate from a.c. supplies between 110 and 240 V and from 40 to 60 c/s. The primary of the mains transformer is fused. For high voltage measurements up to 30 kV an e.h.v. probe can be supplied.

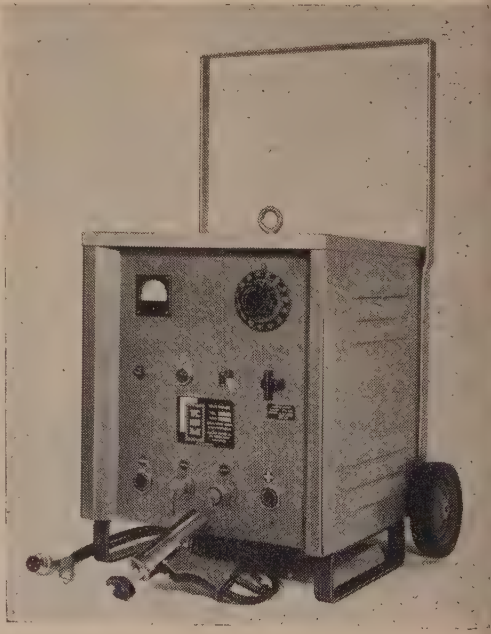
Capacity Discharge Stud Welding

STUD welding equipment based on American designs capable of operating from a standard domestic 13 A socket outlet which can attach studs to materials down to 22 gauge without marking the reverse surface, has been announced by **KSM Stud Welding, Ltd.**, High Street, Old Woking, Surrey. The weld is produced by discharging capacitors through the stud. Small accurately dimensioned projections at the welding end of the studs, which are supplied by the equipment manufacturer, control the weld consistency, variations in size affecting the energy input to the weld. The equipment is suitable for welding most non-ferrous materials, and for joining steel studs to copper, steel to brass, aluminium to aluminium, and stainless steel to mild steel.

The welding sequence involves adjusting a variable transformer to give an appropriate voltmeter reading, indicating the capacitor voltage, and inserting the stud into the chuck in the hand-tool and pressing the trigger switch. This causes the capacitors to discharge through the tip of the stud in contact with the plate and permits a spring within the hand-tool to push the stud into the plate, both stud and plate now being molten. No timing device is used, the heat of the weld being governed only by the voltage applied to the capacitors. The discharge current rises to some 5,000 A and the time cycle is about 4 msec. The penetration for a full area weld ranges from 0·002in to 0·01in depending on the materials in use. After welding a capacitor bank is recharged in 3 or 4 sec, permitting up to 12 welds per minute to be made, normally the maximum rate for the operator.

The first equipment to be put into production is the type CD84 which is suitable for a stud range from 6 BA to ¼in in diameter. This unit essentially comprises a double wound transformer with primary tappings for a 110, 200, 220 or 240 V supply. A 115 V secondary winding supplies a bridge-connected rectifier circuit through a Variac variable transformer. The output from the rectifier charges two 42,000 μF banks of capacitors. A selector switch, interlocked with the main switch, permits either one or both banks to be discharged through the stud. The variable transformer adjusts the voltage to which the capacitors are charged. A single pole change-over contactor normally maintains the capacitors on charge, but when energised by pressing a button on the hand gun connects the capacitors to discharge through the stud. The second output winding provides a 32 V supply to another bridge-connected rectifier supplying a safety circuit which ensures that the capacitors cannot be discharged unless the stud is in the correct position for welding.

The unit measures 15in by 19in by 24in and is supplied with 40ft of welding and control cables, a 15ft earth cable with clamp and the hand welding gun which with 5ft of cable weighs 3¾ lb. The total weight is approximately 225 lb and the welding polarity is reversible. The price, including the gun and cables, will be under £500. Manufacture will shortly commence on single- and multi-head production units.



KSM Stud Welding type CD84 capacity discharge welding equipment

OIL-FILLED CABLES

By G. R. BISHOP

Summary of a paper by A. N. Arman, Ph.D., M.I.E.E., F. J. Miranda, Dr.Ing., M.I.E.E., and G. R. Bishop, on "Progress in Oil-Filled Cables and their Accessories" and a paper entitled "The Influence of Ageing on the Characteristics of Oil-Filled Cable Dielectric" by P. Gazzana-Priaroggia, Dr.Ing., A.M.I.E.E., G. L. Palandri, Dr.Ing., A.M.I.E.E., and V. A. Pelagatti, Dr.Chem. These papers were read before a meeting of the Supply Section of the Institution of Electrical Engineers on 19th April

THE excellent performance of paper-insulated cables for many years enabled makers to keep abreast of electrical development, and not until the 1920's did increased working stresses precipitate serious trouble in service. Investigation eventually revealed the now well-known limitations of solid type cable due to ionisation in voids, and efforts were concentrated on overcoming them.

The earliest solution of the problem, due to Emanueli, was the oil-filled cable in which by means of longitudinal oil ducts combined with suitably positioned oil feed tanks positive oil pressure is at all times maintained and void formation entirely eliminated. Almost complete absence of electrical failure in the many hundreds of miles of oil-filled cable which have been commissioned at system voltages ranging from 33 to 330 kV since 1924, when the first installation at 132 kV was made, is a tribute to the soundness of the original conception.

Cable Developments

Although fundamentally unchanged in principle, progressive innovation in detail has occurred during the ensuing years and as a result electrical working stresses in present-day cables have been almost doubled. The more important factors which have contributed to this advance are:—(1) Significant reduction in dielectric loss, especially at high temperatures, by the introduction of water-washed paper in 1936; (2) marked improvements in both electrical and mechanical characteristics of insulating paper resulting from greater uniformity in structure with optimum combination of density and impermeability; (3) improved screening materials, particularly carbon black loaded paper, giving greater a.c. dielectric strength than plain metallic screens; (4) more thorough degasification of impregnating oil having better gas absorptive properties; (5) establishment of theoretical stability conditions for avoidance of paper creasing when cable is bent, and parallel development of precision lapping machines operating in humidity-controlled enclosures, enabling theory to be put into practice; and (6) more thorough and fully controlled drying by prevalent methods. In a recent development, drying and impregnation are effected by tanking prior to sheathing which subsequently takes place under constantly maintained oil pressure. By this means higher vacua are reached throughout the cable length during drying, and processing times are shortened. The resultant dielectric has reduced power factor.

Corresponding improvements in jointing technique and in electrical design have enabled conventional materials to be more highly stressed. The introduction of quartz-filled epoxy resin having, when cast under carefully controlled conditions, exceptional mechanical and electrical properties combined with imperviousness and good adhesion to metals, has radically improved the design of certain accessories. This material is now used in cable accessories up to and including 400 kV.

Overload Capacity

The maximum operating temperature of most forms of impregnated paper-insulated cable is restricted from consideration of void formation during loading cycles, the dimensions of permissible overload being controlled by this factor. In contrast, permanent absence of voids in oil-filled cable insulation allows the thermal properties of the paper and oil to be more fully utilised. Since 1954 extensive research has been proceeding to ascertain the limit to which operating temperatures may safely be increased.

During this work, a miniature installation of three-core 132 kV, 125 kV/cm maximum design working stress cable complete with all types of accessories was operated at 50 per cent over-voltage for 20 days with loading cycles up to 120°C, followed by 111 days continuously at 120°C or above with twice working voltage superimposed. At intervals during this programme, the installation was subjected to the normal impulse withstand test (640 kVp) at high temperature followed on each occasion by a 24-hour test at 2·5 times working voltage.

In another series of investigations samples of cable taken from installations which had been operating under normal service conditions for up to 25 years at system voltages ranging from 60 to 230 kV, were subjected to tests which included:—(a) Measurement of power factor variation with voltage and temperature; (b) high-voltage a.c. and impulse voltage tests; (c) measurement of oil acidity and power factor; and (d) determination of the mechanical characteristics of the paper by tests of folding endurance.

Accelerated ageing tests on oil and paper separately or in combination, subjected to heat alone or a combination of heat and electric stress, were made in the laboratory under conditions strictly similar to those existing in cables and the results were compared with those obtained on the naturally aged cable. The contributions towards change in dielectric properties made by the various metals used in cables were also investigated. The conclusions reached were that paper is the component most affected by temperature; that power factor increase is moderate and apparently not directly related to time or temperature; and that over the range considered, electric strength is practically unaffected by the combined effect of temperature and electric stress. Temperatures up to 120°C appear permissible for several months in association with maximum working stresses of about 160 kV/cm.

From general assessment of all the experimental evidence, and consideration of the effects of high temperature on cable sheaths, servings and environment, the firm conclusion has been reached that oil-filled cable systems can be operated at conductor temperatures up to 110°C for considerable periods, and at even higher temperatures for shorter times, without measurable effect on life duration.

Future Possibilities

Although developments since the early days of oil-filled cable have been many and varied, scope for further improvement is by no means exhausted. Each forward step may be small, but in the aggregate over a period of years worthwhile economies mature with no increase of risk to the user.

With the advent of 400 and 600 kV cable systems the most pressing need will be for a reduction in dielectric loss by the use of an insulating material other than woodpulp paper. Whether or not this ultimately becomes available, it is certain that development will continue with entirely satisfactory safety margins, which will enable users to accept with assurance the economies offered.

Discussion

These papers led to a long discussion in which sixteen speakers took part. Mr. S. E. Goodall (A.E.I.) agreed with the authors of the paper on ageing that the life of a cable might be considerably increased if it was buried direct in the ground and the constant movement in troughs or ducts eliminated. There might, however, be movement at the ends, where it came out. The authors' conclusion that the effects of periodic overloads or changes in temperature were cumulative suggested that British cable makers had been wise in being reluctant to accept the suggestion of the C.E.G.B. that they should consider emergency overload ratings for cables. He did not agree with the authors of the other paper on the advantages of using still higher levels of impermeability of paper, rendered possible by the introduction of new impregnating techniques. Research had shown that excessive impermeability and density should be avoided because they led to increase in power factor and power-factor-voltage changes. He saw little point in using carbon black for screening the conductor; metallised paper gave the same advantages in regard to impulse breakdown without the disability of power factor change.

Mr. G. S. Buckingham (Midlands E.B.) suggested that in addition to making a cable to withstand 110°C the authors of the paper on ageing should find a device which indicated the temperature of the conductor. This was a most important requirement not so far solved. He agreed with the proposal in the paper by Arman and Miranda to use aluminium sheaths, but had doubts about the effectiveness of the anti-corrosive finish which they proposed to use.

Dr. A. L. Williams (B.I.C.C.) emphasised the importance of ensuring that air and moisture were absent so far as possible. There would, however, always be some residual moisture in a paper cable dielectric and some air remaining, even if initially dissolved in the oil, after the impregnation processes.

Mr. R. S. Orchard (Merz & McLellan) regarded the proposal for a 24 hour voltage type test, to check whether the impulse test had been passed successfully, as an unjustifiable complication. He felt it would be unwise to design h.v. oil-filled cable systems for 110°C until there was far more information than was available at present. It might be better for a code of practice to be prepared similar to that available for transformers.

Mr. J. Banks (B.I.C.C.) said it was not possible to have a very high impermeability of paper, because the paper makers could not ensure uniformity if the impermeability was above a certain level.

Mr. E. H. Ball (Pirelli-General) said that while the suggestion to increase the number of impulses applied might stagger those who organised type tests, it should be quite practicable at the withstand level. He gave the results of tests on 0·2 and 0·6 sq in 33 kV cables which showed that the difference between using 10 and 100 impulses was almost negligible.

Dr. C. H. Gosling (C.E.G.B.) was disappointed that there had been no mention of the strength or characteristics of these cables for d.c. On the subject of overloads, he said that in London there were routes essentially laid direct, but the same size conductor was used when the cables ran in ducts for lengths of up to 50ft. If the temperature was 85°C for the rest of the route, in the centre of the duct it would be of the order of 110°C. Almost all the routes which had these duct runs already ran at 110°C in the centre of the duct and to his knowledge there had been no failures.

Mr. Herman Halperin (U.S.A.), in a written communication read to the meeting, said it seemed to him possible that low-pressure oil-filled cable might operate successfully at the value of 16 kV/mm proposed by the authors of the Italian paper, but they had not in his opinion substantiated that high value. He did not disagree with their proposed limit of 120°C, though it was an outstandingly high value for a manufacturer to suggest. As the result of test data, he believed that so far as only the thermal properties of the cable insulation were concerned it would be safe to operate in emergencies at 140°C, provided the total duration at this temperature in the life of the installation did not exceed one month. Folding endurance seemed an unnecessarily harsh criterion for deterioration; many cables operated satisfactorily when the endurance was almost zero. He preferred tearing strength, and perhaps changes in acidity could be developed to be a good criterion.

Mr. J. A. Baskwell (Pirelli-General) referred to what had been said about the importance of keeping down power factor and of low residual moisture and described a method recently developed for this purpose. The oil-filled cable had a preliminary drying before sheathing and a second vacuum process after sheathing to remove air and residual moisture before impregnation. The factors relating to materials used which influenced power factor were controlled at earlier stages.

Mr. D. J. Skipper (C.E.R.L.) disagreed with Messrs. Arman and Miranda on the importance of higher operating stresses for 400 kV systems and gave reasons for his contention that, in advancing the design stress of 400 kV oil-filled cable, a point was reached where the saving in materials costs was increasingly offset by the detrimental effect of dielectric losses. On the basis of total annual charge, the optimum design stress for such cables was about 180 kV/cm. A significant reduction in the dielectric loss was necessary before any further increase in operating stress was justified. At 600 kV the dielectric losses in oil cable dielectric were likely to be such that little or no useful power could be transmitted and the need for a lower-loss, lower-dielectric-constant material than paper would be paramount. The choice would be confined mainly to the polyolefines, but the compatibility of such materials with insulating oils for long periods was suspect.

Mr. D. M. Cherry examined the bases for the confidence which Messrs. Arman and Miranda expressed in their conclusions. More tests would be necessary to prove that the scatter of the results was small and human considerations were introduced when working on a scale of process control which left no margin for error. A perfect lapping machine might be devised, but it was difficult to devise a perfect lapping machine attendant, and a slight crease in one stressed tape would affect the cable. He felt that a halt should be called to the increase of design stresses, because the yield was getting low, and they should concentrate on much more important matters such as the reduction of the losses and more perfect protective covering, in particular to allow full use to be made of aluminium.

Mr. Mochlinski (E.R.A.) said the E.R.A. had carried out tests on weak concrete mixtures and found it possible to reach a thermal resistivity in the dry state as low as 90-100 thermal ohms.

Mr. W. Holdup (Pirelli-General) described a test on a length of 0·25 sq in 132 kV cable, half of which was buried in cement mortar and the other half left in a clay soil. The cable was heated by passing 400 A through the sheath and after two months stable temperatures of 78°C in the cement and 110°C in the soil were reached. Those temperatures remained stable for many months but when, after a shutdown, the current was applied again, the cable in concrete reached a stable value of 78°C after 40 days, but the cable in the soil now had a temperature approaching 130°C and it was still rising.

Mr. O. S. Johnson, Mr. K. H. Tuson and Mr. W. Holttum also took part in the discussion, to which Dr. F. J. Miranda, Dr. G. L. Palandri and Dr. P. Gazzana-Priaroggia replied. Dr. Miranda said the design of a cable was based on one factor only, ability to withstand the impulse test, but distribution engineers knew that most cables never saw an impulse in their life except switching surges. The main value of the test was that cable systems which withstood it had proved in service to be satisfactory over a long period. Cables could be designed to pass the present type test though they would not be fully satisfactory in service. That was one reason for proposing the 24 hour test.

THE NEW B.E.A.M.A. COUNCIL

LAST week the Council of the British Electrical and Allied Manufacturers' Association met for the first time in its new form. The former offices of president and chairman have been merged and the new offices of deputy president and counsellor created. The counsellors will be entitled to attend Council meetings but not to vote. The Council has been further strengthened by the co-option of several leading figures in the industry who will be members for the first time.*

President:
A. M. Browne
(Hackbridge & Hewittic Electric Co., Ltd.)

Deputy President:
H. H. Mullens
(A. Reyrolle & Co., Ltd.)

Counsellors:
Viscount Chandos (Associated Electrical Industries, Ltd.)
Lord Nelson of Stafford (English Electric Co., Ltd.)
Sir Vincent de Ferranti (Ferranti, Ltd.)
W. K. G. Allen (W. H. Allen, Sons & Co., Ltd.)
J. O. Knowles (Metal Industries, Ltd.)

Members:
R. F. Archer (A.E.I. (Manchester), Ltd.)
G. M. Baker (C. A. Parsons & Co., Ltd.)
*E. B. Banks (English Electric Co., Ltd.)
W. J. Barber (Midland Electric Manufacturing Co., Ltd.)
J. E. Belliss (Belliss & Morcom, Ltd.)
R. Berry (Berry's Electric, Ltd.)
A. W. Browne (Chloride Batteries, Ltd.)
J. A. Crabtree (J. A. Crabtree & Co., Ltd.)
G. F. Davies (Hick Hargreaves & Co., Ltd.)
*R. M. Fairfield (British Insulated Callender's Cables, Ltd.)
S. Z. de Ferranti (Ferranti, Ltd.)
A. H. Frampton (Brush Electrical Engineering Co., Ltd.)
W. Glass (Johnson & Phillips, Ltd.)
A. E. Grimsdale (Associated Electrical Industries (Manchester), Ltd.)
J. H. Hall (Allen West & Co., Ltd.)
W. B. Laing (Bruce Peebles & Co., Ltd.)
A. L. G. Lindley (The General Electric Co., Ltd.)
*Sir Joseph Lockwood (Electric & Musical Industries, Ltd.)
C. A. J. Martin (Crompton Parkinson, Ltd.)
*W. L. Mather (Mather & Platt, Ltd.)
J. C. Milne (Electric Construction Co., Ltd.)
*J. D. Morton (Siemens Schuckert (G.B.), Ltd.)
E. G. Plucknett (Tube Investments, Ltd. (Electrical Division))
J. W. Ridgeway (Associated Electrical Industries (Woolwich), Ltd.)
S. Roberts (Hoover, Ltd.)
J. H. Ross (Chamberlain & Hookham, Ltd.)
*K. Rowell (W. H. Allen, Sons & Co., Ltd.)
E. W. Semmens (Nalder Bros. & Thompson, Ltd.)
A. E. Skan (George Ellison, Ltd.)
W. S. Steel (Associated Electrical Industries (Rugby), Ltd.)
D. D. Walker (Evershed & Vignoles, Ltd.)
*Sir Charles Westlake (Metal Industries, Ltd.)

Financial Section

STOCKS and SHARES

BETTER news from the heavy sides of industry has been noticeable in the recent spate of company reports. At the A.E.I. meeting, Lord Chandos described the outlook for "those parts of the business which are predictable" as much better than it was in 1960. He expected more favourable results from most of the group's divisions, although difficulties still had to be faced in exports and in the entertainment and appliances business. Earlier, the preliminary statements of results by both C. A. Parsons and A. Reyrolle had made favourable impressions, which were fortified by the disclosure in the latter's full report that the inflow of orders in the last half of 1960 ensured full employment in the works for at least a year ahead. Experiences of Babcock & Wilcox and Vickers were well up to market expectations, and although John Thompson issued a warning that the accounts would show a substantial loss, with no final dividend likely, this was accompanied by references to a very healthy order book and encouraging further prospects.

Market Reactions

Reyrolle shares were marked up further to 51s 6d x.d. after publication of the full report, and C. A. Parsons at 72s x.d. added another 2s 3d to the 9s rise induced earlier by the announcement of increases in profits and the dividend. A.E.I. were easier on balance, at 44s 6d. Among the points made by the chairman was his explanation that the greater part of the group's overdraft total of £9 million was largely self-liquidating, and that no issue of fresh capital was proposed. Vickers were advanced to 37s and John Thompson, already depressed in advance of the company's statement, turned better when the news was known.

Price Changes

Few of the Budget proposals seem to have made much lasting impact upon Stock Exchange markets, although they have notably improved confidence in gilt-edged stocks, and some movements in industrial shares—such as another sharp rise in I.C.T.—might be traced to the payroll-tax possibility. Despite the disturbing news from France, share prices continued to be reasonably well supported. Among electrical shares, B.I.C.C. advanced firmly to nearly £3 while waiting news of the intended capital issues. Ericsson Telephone and Automatic Telephone remained in favour, and Decca "A" again came into prominence. Simon Engineering at 41s 3d. x.d. and Davis & Timmins at 46s continued to reflect satisfaction with the latest reports, while Joseph Lucas at 68s 6d and S. Smith at 23s shared in a general improvement of motor accessory shares.

Babcock & Wilcox Recovery

The recent recovery in the price of Babcock & Wilcox £1 shares was

Price Changes in

Company or Board	Nom. Value	Middle price 24th April	Week's Rise or Fall	Dividend		Yield %			1961	
				Pre-vious	Last	£	s	d	High-est	Low-est
Gilt-edged Stocks										
Brit. Elec. 1968/73	100	75	+½	3	3	4	0	0	75	73¾
Brit. Elec. 1974/77	100	70½	+½	3	3	4	5	0	70½	69½
Brit. Elec. 1976/79	100	72½		3½	3½	4	16	6	73½	71½
Brit. Elec. 1974/79	100	81½	+½	4¼	4¼	5	4	3	82	80½
Brit. Elec. 1967/69	100	91		4½	4½	4	19	0	91½	89½
Overseas Electric Supply										
Calcutta Elec.	£1	22/-		7†	7½†	11	2	6	22/-	20/6
East African Power	£1	14/-	−6d	8	10	14	5	9	15/-	13/3
Nigerian Elec.	£1	16/6		8	10	12	2	6	19/9	15/6
Perak Hydro-Elec.	£1	20/-		10	10	10	0	0	20/-	17/6
Electrical Shares										
Aberdare Holdings	5/-	15/6	−3d	17½	17½	5	13	0	16/-	14/3
Aerialite	1/-	8/-	+6d	54	54	6	15	0	7/6	6/9
Allen, W. H.	£1	39/-		14	10*‡	5	2	6	39/-	36/-
Allied Insulators	5/-	9/6		20	10*	5	5	3	9/6	8/9
Alwyn Holdings	5/-	26/6		—	12½	2	7	3	27/-	24/6
Anglo-Portuguese Tel.	£1	19/9	+9d	9	9	9	2	6	25/-	19/-
Arcolectric	1/-	5/6		15	15	2	14	6	6/-	3/9
Aron Meters	£1	70/-		15	15	4	5	9	70/-	67/6
Assoc. Elec. Ind. Ord.	£1	44/6	−3/6	15	15	6	14	9	48/6	39/6
Automatic Tel. & El.	5/-	20/3	+6d	17	17	4	4	0	20/3	14/9
Babcock & Wilcox	£1	35/3x.d.		9	9	5	2	3	36/6	30/3
Bakelite	10/-	57/-		17½	17½*	3	1	6	57/-	42/-
Baldwin, H. J.	2/-	1/3	−3d	10	Nil	—			1/6	1/6
Berry's Electric	5/-	49/6	+9d	30	30*‡	3	0	6	49/6	37/-
Bowthorpe Holdings	2/-	9/6		27	18½*	3	17	9	9/6	8/-
Brit. Elec. Resistance	2/-	8/3	+3d	17½	17½*‡	4	4	9	8/9	6/6
Brit. Elec. Traction:										
Def. Ord. "A"	5/-	55/-	+6d	35	40	3	12	9	55/-	41/9
Brit. Electronic Ind.	5/-	14/6	−9d	—	15‡	5	3	6	15/3	12/3
B.I. Callender's	£1	59/9	+3/6	13½	13½	4	10	3	60/-	49/6
B.I. Callender's 6% Pref. ...	£1	17/6		6	6	6	17	3	18/3	17/6
British Thermostat	5/-	34/-	−1/-	35	20*	2	18	9	40/-	28/-
Brook Motors	10/-	50/-	+6d	25	25*	5	0	0	50/-	47/-
Bulgin, A. F.	1/-	10/3x.d.		55	40*	3	18	0	10/6	7/9
Bulpitts	5/-	23/3x.d.	+6d	15	16½	3	10	0	26/3	16/9
Burco Dean	5/-	9/6		18	14	7	18	0	10/-	8/9
Cable & Wireless	5/-	18/-	+6d	10	10*‡	2	15	6	19/3	12/6
Cambridge Instruments ...	5/-	37/6	+9d	12½†	22	2	18	9	37/6	30/-
Chloride El. Storage "A" ...	£1	82/6	−1/3	17½	20	4	17	0	91/-	72/-
Clarke Chapman	£1	52/6	−1/3	13¾	13¾	5	4	9	54/-	43/6
Combined Elec. Mfrs.	4/-	9/6		—	12½‡	5	5	3	9/6	7/6
Contactor Switchgear	5/-	15/-		14	14	4	13	3	16/-	14/6
Cossor, A. C.	5/-	6/3	−3d	5	Nil	—			8/-	6/6
Crabtree	10/-	30/-	−1/-	20	12½*	4	3	6	33/9	26/3
Crompton Parkinson	5/-	13/6		14	12½*	4	12	6	14/-	11/3
Davis & Timmins	5/-	46/-	+1/6	25	35*	3	16	0	46/3	30/3
De La Rue	10/-	65/-	+9d	22½	22½‡	3	9	3	65/-	55/-
Decca "A"	10/-	69/-	+3/6	20	23⅓	3	7	3	70/-	52/3
Desoutter	5/-	61/3	+3d	30	35	2	17	3	61/3	49/-
Dewhurst	2/-	10/-	−3d	20	20	4	0	0	10/3	7/6
Dictograph Tel.	2/-	12/3	+6d	20	20*	3	5	3	12/3	8/6
Dimplex	5/-	65/3	−9d	—	30	1	18	3*	71/-	47/9
Dubilier Condenser	1/-	3/-		25	30	5	0	0*	3/-	2/3
Duport	5/-	16/-	+3d	17½	20	4	3	3*	16/-	12/6
E.M.I.	10/-	48/6	−6d	20	17½*	3	12	3	51/3	41/6
Eleco	2/-	8/6		20	20	2	7	0*	8/6	4/3
Electrical Apparatus	5/-	18/-	+9d	14½	20	5	11	0	18/-	17/-
Electrical Components	5/-	9/6		15	11½*	6	1	0	9/6	9/-
Elec. Construction	£1	36/3	−1/3	9	9	4	19	3	39/-	30/6
Elliott-Automation	5/-	35/6	−9d	9·3	13	1	16	9	36/6	25/6
Enfield Rolling Mills	£1	47/6	+1/-	15	15	6	7	9	51/6	45/6

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

retained after the company's report of a 70 per cent improvement in the trading profits for 1960 and the maintenance of the dividend at the 9 per cent rate to which it was reduced as a result of a heavy reverse a year previously. After tax adjustments the net surplus shows a proportionately small expansion, but it covers the distribution with a little to spare on this occasion, whereas there was a deficiency last time. At a price of 35s 3d x.d., which is still less than half the quotations ruling a few years ago before the intensification of difficulties for the boiler manufacturers, the shares show a yield of just over 5 per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 24th April	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1961 Highest	1961 Lowest
Electrical Shares—continued						£ s d		
English Electric	£1	37/3	−6d	10	10	5 7 6	40/9	32/-
English Electric 3¾% Pref. ...	£1	11/-		36	3¾	6 16 6	11/9	11/-
Ericsson Tel.	5/-	32/-	+9d	13†	13†	3 6 3	32/-	23/3
Ever Ready	5/-	36/3	+1/3	27½	20*	2 15 3	36/6	31/6
Falk Stadelmann	£1	26/-		10	7½	5 15 6	26/-	21/9
G.E.C.	£1	36/6x.d.	−1/-	10	10	5 9 6	40/-	29/3
G.E.C. 6½% Pref.	£1	18/9		6½	6½	6 18 9	19/3	18/3
General Cables	5/-	5/6		15	Nil	—	6/3	3/9
Goblin (B.V.C.)	5/-	7/6		12½	10	6 13 3	8/6	6/-
Hackbridge Holdings	5/-	5/9		20	20	8 14 0*	6/9	5/-
Harland Engineering	5/-	15/3	−2/3	16	16	5 5 0	19/-	15/3
Head Wrightson	5/-	28/9	+9d	20	14*	2 8 6	30/-	22/-
Heatrae	2/-	16/9	+1/3	20	22½	2 13 9	16/9	12/6
Holophane	5/-	20/-	+3d	26	30	7 10 0	20/3	17/3
Hoover	5/-	53/9		90	45*	4 3 9	53/9	46/-
Hunt, A. H.	4/-	24/3		20	20	3 6 0	25/9	18/-
Intl. Combustion	5/-	32/6	+1/3	30	30	4 12 3	32/6	24/-
Intl. Computers & T.	£1	98/-	+2/-	0	11¼	2 6 0	100/-	59/-
Johnson & Phillips	£1	20/9	+6d	5	Nil	—	22/9	17/6
Kenwood Mfg.	1/-	5/3	−6d	—	—	—	6/-	5/3
Laurence Scott	5/-	18/6	−3d	15	15	4 1 0	18/9	15/3
Lister, R. A.	£1	55/-		14	14	5 1 9	55/-	47/3
Lucas, J.	£1	68/6	+1/-	12½	13¾	4 0 3	68/6	62/-
Marryat & Scott	2/-	17/6	+6d	22½	27½	3 2 9	17/6	13/9
Mather & Platt	£1	43/9		11	11	5 0 6	51/6	41/6
Metal Industries	£1	64/6		14	15	4 13 0	64/6	53/-
Midland Elec. Mfg.	£1	64/-	+3d	12	12	3 15 0	64/3	58/6
Murex	£1	47/-	+6d	15	20	4 17 6*	47/6	39/3
Newman Ind.	2/-	6/-x.d.	+3d	12½	15	5 0 0	6/-	5/-
Oldham & Son	1/-	3/-		17½	17½*‡	5 10 0	3/-	2/3
Parsons, C. A.	£1	72/-x.d.	+2/3	9⅜	12½	3 9 6	72/6	46/9
Philips' Lamps	Fl.10	245/-		16	16*	1 6 0	£13¼	£10½
Plessey	10/-	59/6		15½‡	17‡	2 17 0	60/-	46/6
Pullin Group	2/-	15/-		25	25	3 6 9	15/-	11/3
Pyrotenax	5/-	60/-	−1/3	34	40	3 6 9	61/3	46/6
Radiation	£1	33/-	−4/6	12	10	6 1 3	37/6	31/6
Reliance-Clifton	5/-	27/6		15	15	2 14 6	27/9	22/6
Reyrolle	£1	51/6x.d.	+2/9	175	9¾*	3 15 9	51/6	36/6
Richardsons Westgarth	10/-	7/9	−6d	8⅛	8⅛	—	7/9	6/6
Sangamo Weston	10/-	33/6	−6d	12½	13⅓	3 19 9	34/6	26/3
Scott, James	5/-	26/6		24	25*	4 14 3	27/9	25/6
Simon Engineering	5/-	41/3x.d.	+2/-	—	27½	3 6 9	42/6	28/-
Smith (England), S.	4/-	23/3	+1/-	17½	20	3 8 9	23/9	17/-
Southern Areas	£1	19/-	+9d	5	6	6 6 3	21/-	14/6
Strand Elec.	5/-	18/3		14·6	20‡	5 9 6	20/-	12/3
Sturtevant	5/-	15/6		15†	15†	7 19 0	18/6	13/9
Sun Elec.	5/-	17/3		15	18½	5 7 3	17/6	17/-
T.C.C.	10/-	41/-		35	22½*	5 9 9	41/-	40/-
Telephone Rentals	5/-	29/-	+9d	12½	15*	2 11 9	29/-	21/9
Thompson (John)	5/-	15/3	+1/-	25	20	—	16/9	14/-
Thorn Elec.	5/-	59/-	−3/6	20	25	2 2 3	63/-	44/6
Thornycroft	£1	28/9	+9d	6	6	4 3 6	34/9	25/9
Tube Investments...	£1	79/-	−3/6	—	14	3 11 0	85/-	72/6
Ultra Electric	5/-	22/6	+2/6	20	25	5 11 0	23/6	12/6
Walsall Conduits	4/-	14/3		22½	15*	4 4 3	14/3	10/9
Ward & Goldstone	5/-	35/9		30	35	2 9 0*	36/6	25/6
Watford	2/-	9/3	+6d	25	20*	4 6 6	10/9	8/6
Westinghouse	£1	41/9		11	11	5 5 3	42/-	36/-
West, Allen	5/-	13/6	−3d	12½	13½	5 0 0	14/6	11/6
Wilkins & Mitchell	5/-	14/-		17	21*	—	15/3	11/9
Wolf Electric	5/-	17/-	−6d	12½	13¾	4 1 0	17/6	14/-

Profits Reduced

Although expectations are prepared this year for reports of reduced earnings by manufacturers of the sort of goods most affected by the hire-purchase restrictions, the extent of the setback shown in the figures published by both Murphy Radio and Radiation proved to have been rather larger than had been apprehended. The turnround in the Murphy company's accounts from a 1959 profit of £668,000 to a loss of £76,000 means no dividend for 1960. Radiation's group profit fell by almost two-thirds to just over the million mark; the dividend is being repeated at 10 per cent, but without last year's additional 2 per cent bonus. Both shares were marked down fairly sharply after the announcements. Laurence, Scott 5s shares were also dull at 18s 6d on the report of lower profits, although the dividend is being maintained.

Dividends Declared

There was little net alteration in the price of Allen West 5s shares, at 13s 6d, after the announcement of a 1960 profit just about level with the previous year's, and a final dividend making a total of 13½ per cent, the same as the payment for 1959 (of which 1 per cent was in the form of a bonus). Kango Electric Hammers 4s shares, at 18s 3d, reacted well to the announcement of another substantial rise in earnings and a further increase in the dividend to 20 per cent. The new rate is covered the best part of three times by earnings, and puts the shares on a 4½ per cent yield basis. In declaring an increase in the interim dividend from 6 to 8 per cent, the directors of Electrical Apparatus indicate that this should not be taken to imply a larger total for the year, but report well upon the trend of business.

Chairman's Views

Demand for Bulpitt's main proprietary products is said in the company's full report to have remained at a high level, while other sections have not yet fully recovered from the effects of the credit squeeze. Profits for 1960 contracted a little, and there is no change in the dividend at 16¼ per cent, but there has been a rise of as much as 5s in the price of the 5s shares, to 23s 3d, since the preliminary announcement of these results a month ago. Southern Areas Electric's disposal of its interests in the consumer industries, and subsequent concentration on capital goods, is among the reasons for the chairman's confidence in further progress this year.

REPORTS and DIVIDENDS

Associated Electrical Industries, Ltd., have no proposals for the issue of additional capital, Lord Chandos told shareholders at the annual general meeting. Of the group's bank overdrafts totalling over £9 million, £5½ million related to the financing of the Berkeley nuclear power station contract and was largely self-liquidating.

He expected more favourable results in 1961 from the majority of the company's divisions. There was no doubt, however, that in both exports and in the "entertainment" and appliance business the company would face a difficult year. A.E.I. was well equipped to face it.

No industry could expect to grow every year, and the fact that the electrical industry had been faced with some difficulties during the last three years, and profits had not been so buoyant as they used to be, had given rise to the view that the industry was not in fact a growth industry of the attraction presented by some others.

This, in Lord Chandos' opinion, was an entirely false assumption. There could be no general expansion in industry or in national prosperity, either in this country or in any other, unless the electrical industry, and for that matter the chemical, were in the forefront of the growth. Not only could the company expect expansion in their long-established products, but also in new products.

Referring to the four parts of the business that had caused anxiety in 1959 (namely cables, telephones, lamps and lighting and nuclear power), Lord Chandos said that rationalisation of the cable division was now practically complete and profits should be made in 1961. The telecommunications division in 1960 traded at a marginal loss but the outlook for 1961 was more favourable and it was hoped to make a moderate return on the capital employed. In 1960 A.E.I. increased its share of the market in lamps and lighting and traded at a better though still inadequate profit. Some further improvement, Lord Chandos said, should be made in 1961.

On nuclear power Lord Chandos said that the merger of the A.E.I.-John Thompson Nuclear Energy Co., Ltd., with the Nuclear Power Plant Co., Ltd., had enabled large savings to be made in technical staff and in costs and the operations now appeared to be adjusted to the likely volume of orders. Though competition was extremely keen, a modest profit was expected on the Dungeness contract. The loss on Berkeley, he said, should be regarded as a development expense.

The eight divisions engaged in producing equipment for the generation, distribution and application of electrical energy had had a normal year and traded successfully. In 1960 the result from A.E.I. business in electric and other heat treatment furnaces was poor. Towards the end of the year, however, the business in all types of furnaces showed a notable increase, which was reflected in a much higher order book, and 1961 should produce favourable results.

A.E.I.-Hotpoint increased its share of the market but not sufficiently to prevent a fall in profits due to low volume.

The group order book was a record and exports rose by £3 million on 1959. Orders received by A.E.I. in 1960 for turbo-alternators were more than those of any individual manufacturer in the world and greater than those of all other British manufacturers put together.

But, Lord Chandos said, the export business had been highly competitive, margins had been inadequate, and these conditions were likely to continue in 1961. The British, of all people, could least afford to let their costs rise. It was true to say that, industrially, by far the greater part of the cost reductions which could otherwise have been effected had been absorbed by increased wages or by the effect of shorter hours. Costs in the British engineering industry were still too high. We must get rid of the idea that the installation of new machinery and new processes merely afforded the opportunity for asking for higher wages or shorter hours. In that way we should fall behind our competitors on the Continent. The company had shown its willingness to invest large sums of money in new plants in order to reduce costs, and provide the best tools, layout, and handling facilities which were available. A.E.I. would continue this policy. It lay in the hands of those whom they employed, at every level, to ensure that the company could meet competition abroad and improve our industry: this was harder to do than to weaken it by allowing wage demands to outrun the improvement in productivity.

The British electrical industry's task of increasing exports was made more difficult by the inadequacy of the margins on much of its home business. It was vital that the margins accepted by the big monopoly buyers such as the British Transport Commission, the National Coal Board, the Central Electricity Generating Board, the Area Electricity Boards, and the Post Office, should take full account of the huge investment required in plant and in working capital and the large sums which must be spent on research and development. In an industrial community the protection of the so-called consumer could be carried to such lengths that great damage was done to the producer himself, and to industry.

It was quite obvious that if the consumer was protected to an extent which led to industrial margins being too low to sustain research and development, then the economy would wither, and would be unable to employ the same numbers as it now does. It would be ironical to find the consumer so highly protected that the industry in which he was employed got on to the rocks.

Progress by Reyrolle.—In his annual statement, the chairman, Mr. H. H. Mullens, says that the inflow of orders for A. Reyrolle & Co., Ltd., over the last half year reached a new high level and the company's works will be fully employed for at least the next twelve months. Competition continues to grow in severity, and it is essential to strive continuously for further economies in design and manufacturing techniques. Unfortunately there are costs outside the company's control which flow from Government action and certainly this is not the time to transfer to industry any more of the burden of meeting heavy Government expenditure.

Much of the increased demand from industry in this country for the company's products has come from the large capital programmes of the steel and motor car industries. Without these large programmes the demand for their industrial equipment would have been much reduced. It is, however, to be expected that there will be a more general revival of capital development, requiring electrical equipment such as their industrial switchgear.

The company's recent successes in the export market have shown its ability to compete with foreign manufacturers but profit margins are low and continued success will depend upon holding costs to which reference has already been made. Export of lower voltage distribution switchgear to countries where there is local manufacture and where tariff barriers exist has become difficult. The board therefore plans to manufacture in certain countries. Some of their new designs are particularly suited to overseas

[*Continued on page 769*

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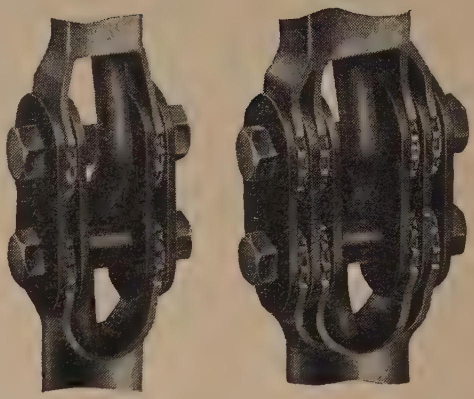

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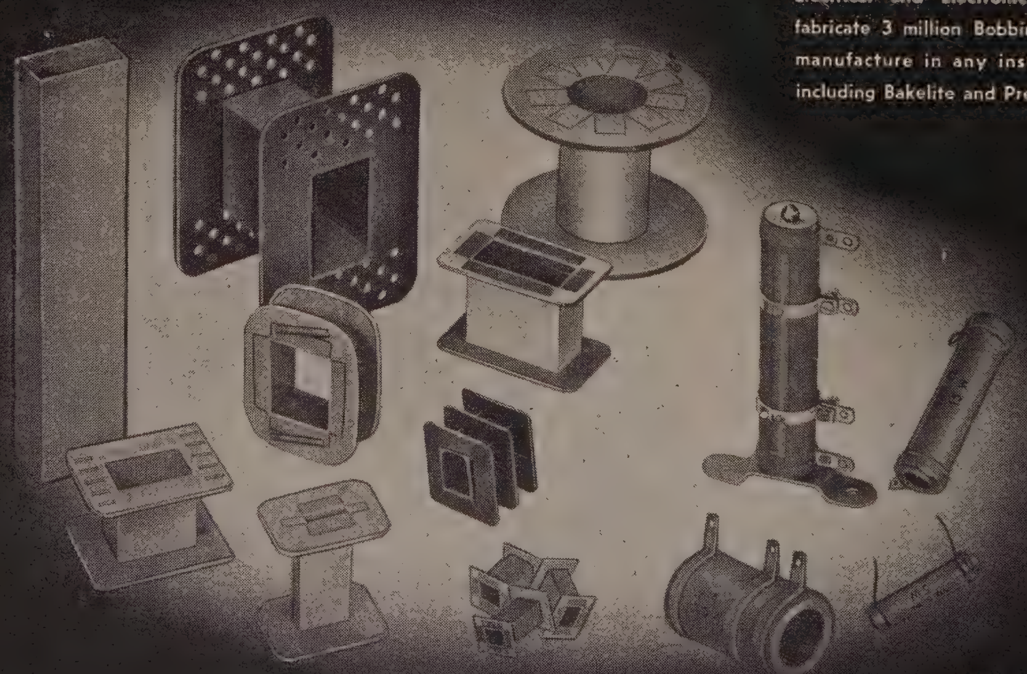

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FINANCIAL SECTION (*continued*)

markets and to local manufacture and assembly. Agreements have been signed with Oliver J. Nilsen (Australia), Ltd., for collaboration in the manufacture of high-voltage switchgear and ancillary equipment in Australia.

It is proposed to form a new company, Reyrolle Nilsen (Australia) Pty., Ltd., with an authorised capital of £500,000 and registered office at 45, Bourke Street, Melbourne, Victoria. The first directors will be Messrs. Oliver J. Nilsen, C.B.E. (chairman), and O. V. A. Nilsen, representing the Nilsen interests, Messrs. J. Bennett, M.I.E.E., and G. Robinson, representing the Reyrolle interests, with Mr. E. L. Cottrell as secretary.

Progressive stages of manufacture will be undertaken at a factory to be set up in Melbourne and staffed with a nucleus of people trained at Hebburn. In the first stages, high-voltage switchgear will be part-manufactured and assembled.

Oliver J. Nilsen (Australia), Ltd., have factories in Victoria and South Australia which manufacture low voltage switch and fuse gear, electric motor control equipment, transformers, switchboards and cubicles, and electrical appliances.

Enfield-Standard Loss. — Enfield-Standard Power Cables, Ltd., traded at a substantial loss during the year in common with the power cable elements of other cablemaking groups, Lord Verulam, chairman of Enfield Rolling Mills, Ltd., reports in his annual statement. Although most current prices are back to a proper competitive level, long-term contracts mean that it will be the middle of 1961 before the great majority of invoicings are at current selling levels. This salutary lesson, he says, of how easy it is to destroy and how long it takes to rebuild has not been lost upon the trade as a whole.

Enfield-Standard Power Cables has more than maintained the volume of its two parent companies and the technical integration and balancing of the two undertakings is being successfully achieved. The expectation, mentioned last year, that Enfield Cables, Ltd., in its restricted field would operate profitably was fulfilled.

Bulpitts (Swan Brand), Ltd.—In his annual statement the chairman (Mr. J. M. Fitzroy Newdegate) says that the decline in trading profits (as reported in the *Electrical Review* of 24th March) was disappointing because there was a substantial increase in sales. The chief contributory factor was the introduction of the shorter working week which caused a big increase in manufacturing costs, only part of which could be recovered by increased prices owing to the competitive condition of the market. The greater part of the increase in sales came in the first half of the year; later there was a big drop in sub-contract work for other manufacturers of major electrical appliances and a setback in sales of the company's automatic dishwasher. Since the relaxation of hire-purchase controls there has been a notable improvement in both sections. Exports increased by 20 per cent.

Demand for principal proprietary products continues at a high level, but other sections have not fully recovered from the credit squeeze. This and the effect of the wage award last December has led to a further general increase in selling prices.

Mawdsley's Order Book.—In his annual statement, Lord Gridley, chairman of the Southern Areas Electric Corporation, Ltd., says that concern expressed last year about the intake of orders by Mawdsley's, Ltd., had been justified. Although orders started to increase in volume about mid-year and continued to do so until the end of the year and are still mounting, the flow began too late to affect 1960. The result was that Mawdsley's profit was no more than marginal in spite of the fact that the year ended with an almost doubled order book.

For the group as a whole, the order book at the end of March was more than twice as large as at the end of 1959. Although profit margins have narrowed, Lord Gridley is "reasonably confident that 1961 will show further progress, especially as we have now disposed entirely of our interest in the consumer goods industry and are concentrating almost exclusively on capital goods."

Babcock & Wilcox, Ltd., are maintaining their dividend for 1960 at the lower rate of 9 per cent paid in 1959 with a final dividend of 4½ per cent. Group profit for the year, including investment income and after all charges and debenture interest, rose from £523,154 to £890,584, but there is a charge for U.K. tax of £157,944 against the previous year's credit of £150,137.

After minority interests, and including transfers from reserves, sundry capital profits and unrequired tax, the balance available for distribution of £1,142,198 compares with £816,160.

Allen West & Co., Ltd., again recommend a final dividend of 8½ per cent, making 13½ per cent for the year ended 31st January, 1961 (the same). The group profit for the year, after all charges (including taxation) amounted to £407,485 (£408,168). U.K. taxation was £242,595 (£241,132), after deducting £39,706 (£35,212) for taxation in previous years no longer required. The amount of group profit attributable to members of the holding company amounted to £406,833 (£407,518). The sum of £100,000 has again been transferred to general reserve by the parent company.

Laurence, Scott & Electromotors, Ltd.—Trading profits fell sharply from £1,122,674 to £872,167 in 1960. The final dividend is maintained at 10 per cent, making an unchanged 15 per cent total. After tax of £300,000 (£410,000) the net balance is £310,719, against £415,322.

Vactric and "News of the World."—The "News of the World" Organisation, Ltd., has agreed to purchase the whole of the issued share capital of Vactric (Control Equipment), Ltd., and Vactric (Precision Tools), Ltd., from the receiver of Vactric, Ltd. (in liquidation).

New boards of the above companies will be formed with Sir William Carr as chairman and Mr. T. W. Roberts will continue as managing director. The boards will also include Mr. G. Reed, Mr. P. J. Lawson and Mr. G. E. Edwards, the present executive directors.

Telephone Rentals' Scrip Issue.—An unchanged 10 per cent final dividend, maintaining 15 per cent for 1960, and a one-for-five scrip issue are announced by Telephone Rentals, Ltd. Group net profits rose from £837,503 to £990,012 after heavier taxation.

Elliott-Automation, Ltd., report a sharp rise in profits from £1,363,187 to £2,269,500 for 1960 and the dividend is being raised from the equivalent of 9⅓ per cent to 13 per cent with a final dividend of 8 per cent. The Rheostatic Co., Ltd., acquired last year, contributed £520,648.

Kango Electric Hammers, Ltd., are paying a final dividend of 12½ per cent, making 20 per cent for 1960 against 17½ per cent. Group net profit increased to £63,999 from £46,064 after tax of £60,280 (£38,589).

The General Electric Co., Ltd., is paying a second interim dividend of 7 per cent (the same) in occordance with the merger terms with Radio & Allied (Holdings), Ltd.

Wm. Sanders & Co. (Wednesbury), Ltd.—The dividend for 1960 is raised by 5 per cent to 30 per cent. Net profit is £42,202 (£35,908) before tax of £20,763 (£17,718).

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1955

2403. Minister of Supply.—Photoconductive cells. 23rd April, 1956. (865866.)
13414. Primary cells. 9th May, 1956. (865810.)

1956

10895. Factories Direction, Ltd.—Screens adapted to give protection against neutrons. 8th April, 1957. (865435.)

15491. Electric & Musical Industries, Ltd.—Reversible coupling circuits for counting devices. 20th May, 1957. (865867.)

23678. Electric & Musical Industries, Ltd. —Television system convertors. 30th July, 1957. (865436.)

23742. Mullard, Ltd.—Cathode-ray tubes. 4th June, 1957. (Cognate applications 24560, 10th August, 1956, and 5511, 18th February, 1957.) (865663.)

26699. Associated Electrical Industries, Ltd.—Holders for electric devices, such as lamps. 16th August, 1957. (865868.)

27622. Associated Electrical Industries, Ltd.—Wave guides. 10th October, 1957. (865591.)

28014. Mullard, Ltd.—Cathode-ray tubes. 2nd July, 1957. (865664.)

30837. Telegraph Condenser Co., Ltd., and Sporing, P. A.—Electrolytic capacitors. 8th October, 1957. (865437.)

33010. General Electric Co., Ltd.—Methods of joining graphite to graphite and graphite to metal surfaces. 22nd October, 1957. (865592.)

36115. Ferguson Radio Corporation, Ltd. —Communication systems. 23rd September, 1957. (865580.)

1957

294. Electric & Musical Industries, Ltd.—Electrical interpolating devices. 3rd January, 1958. (865453.)

739. Associated Electrical Industries, Ltd. —Magnetic crack-detecting devices. 22nd November, 1957. (865910.)

3281. Mullard, Ltd.—Cathode-ray tubes. 1st November, 1957. (865666.)

9173. Ransburg, H. J., Ransburg, H. G., Ransburg, H. P., and Ransburg, E. M. (trading as Ransburg Co., Harper, J.).—Apparatus for electrostatically depositing liquid coating material. 20th March, 1957. (865763.

19976. Igranic Electric Co., Ltd.—Electric motor controllers. 25th June, 1957. (865525.)

26327. Parks-Cramer Co.—Electric switch. 20th August, 1957. (865458.)

26684. Tesla Narodni Podnik.—Circuit for glow discharge tube indication of a decimal tube counter stage. 23rd August, 1957. (865623.)

27079. Egyesült Izzolampa es Villa-Mossagi R.T.—Circuit arrangement for the demodulation of electric oscillations modulated in frequency or in phase. 28th August, 1957. (865382.)

36805. Pye, Ltd.—Transistors. 26th November, 1958. (865368.)

38010. General Electric Co., Ltd., and Arnold, G. H.—Battery operated electric equipment. 6th March, 1959. (864935.)

39641. Standard Telephones & Cables, Ltd.—Telephone sub-sets. 19th December, 1958. (865012.)

1958

1017. Philips Electrical Industries, Ltd.—Electron microscopes. 10th January, 1958. (865369.)

1327. E. I. Du Pont de Nemours & Co. —Production of elemental silicon. 14th January, 1958. (865249.)

2439. Philips Electrical Industries, Ltd.—Time-base circuit arrangements. 24th January, 1958. (865463.)

6899. Licentia Patent-Verwaltungs-G.m.b.H.—Mechanical current convertor. 4th March, 1958. (865678.)

7060. General Electric Co., Ltd., and Collins, L.—Methods of joining waveguides. 2nd March, 1959. (865782.)

7387. Bush & Rank Cintel, Ltd.—Non-linear amplifier circuits. 9th March, 1959. (865466.)

7388. Bush & Rank Cintel, Ltd.—Method of testing electronic amplifiers. 9th March, 1959. (865467.)

7947 and 7950. General Electric Co., Ltd. —Leakage reactance transformers. 25th February, 1959. (865468/9.)

9278. Westinghouse Brake & Signal Co., Ltd., Fleet, A. D., and Miller, G. D.—Electric pulse totalising arrangements. 24th June, 1959. (865571.)

9401. Marconi's Wireless Telegraph Co., Ltd.—Automatic distortion correcting arrangements for frequency modulated communication systems. 20th October, 1958. (865572.)

9594. Engelhard Hanovia, Inc.—Starting and operating circuit for high-pressure vapour arc lamps. 25th March, 1958. (865532.)

11194. General Electric Co., Ltd.—Power operated brake gear. 24th March, 1959. (865430.)

11202. Westinghouse Electric Corporation.—Thermo-electric devices. 9th April, 1958. (865541.)

11428. Associated Electrical Industries, Ltd.—Production of luminescent screens for cathode-ray tubes. 25th March, 1959. (865638.)

12664. Ericsson Telephones, Ltd.—Contact cleaning device. 22nd May, 1959. (865390.)

12709. Dust Control Processes, Ltd.—Dust separators. 20th April, 1959. (865151.)

13771. General Telephone Laboratories, Inc.—Automatic telephone dialling apparatus. 30th April, 1958. (864937.)

14046. Westinghouse Electric Corporation.—Processes for making transistors. 2nd May, 1958. (865471.)

14926. Raytheon Co.—Semiconductor device. 9th May, 1958. (865401.)

15576. United Kingdom Atomic Energy Authority.—Phase-sensitive electric circuit arrangements including relays. 12th May, 1959. (865643.)

18361. General Electric Co., Ltd.—Electric protective systems. 2nd June, 1959. (865775.)

18555. Varian Associates.—Magnetometers of the precessing atomic portion type. 10th January, 1958. (864941.)

18799. Igranic Electric Co., Ltd.—Electric motor control systems. 12th June, 1958. (864955.)

22033. Philips Electrical Industries, Ltd. —Magnetic focusing systems for travelling-wave tubes. 9th July, 1958. (865725.)

22885. D. Napier & Son, Ltd.—Electrical pulse counting apparatus. 10th July, 1959. (865690.)

25041. Mullard, Ltd.—Selector circuit arrangements. 8th September, 1959. (865899.)

25436. Ericsson Telephones, Ltd.—Manufacture of insulated electric wires and the like. 11th August, 1959. (865900.)

37403. Aluminium-Walzwerke Singen G.m.b.H.—Forming of dielectric layers on aluminium foils for electrolytic capacitors. 20th November, 1958. (865323.)

37542. Weller, C. E.—Electric soldering irons. 21st November, 1958. (865347.)

37621. Marconi's Wireless Telegraph Co., Ltd.—Automatic gain control circuit arrangements. 24th August, 1959. (865122.)
27807. Integrator circuit arrangements. 24th August, 1959. (864963.)

38104. General Electric Co., Ltd.—Sealing-in machines for the manufacture of electric incandescent lamps and similar devices. 25th November, 1959. (865550.)

39236. Pressed Steel Co., Ltd.—Refrigerating system. 3rd December, 1959. (865026.)

1959

1651. Westinghouse Electric Corporation. —Over-temperature protective systems for electric motors. 16th January, 1959. (865649.)

3409. Bendix Corporation.—Electrical connector. 30th January, 1959. (865477.)

3835. Scherchen, H.—Electrical sound reproduction apparatus. 3rd February, 1959. (865578.)

5408. Zavody V.I. Lenina Plzen Narodni Podnik.—Method of measuring the period of a nuclear reactor. 17th February, 1959. (865552.)

6035. Short Bros. & Harland, Ltd.—Electrical and electronic apparatus. 26th January, 1960. (865874.)

8049. Westinghouse Electric Corporation. —Magnetic amplifier systems. 9th March, 1959. (865487.)

8965. Westinghouse Electric Corporation. —Apparatus for controlling the excitation of a dynamo-electric machine. 16th March, 1959. (865846.)

9561. Oak Manufacturing Co.—Electromagnetic interruptors. 19th March, 1959. (865668.)

11344. Besuch, J. A.—Magnetic device for handling ferromagnetic articles. 3rd April, 1959. (865502.)

13843. Cannon Electric Co.—Solenoid. 23rd April, 1959. (865740.)

14789. Preh, W., and Preh, A. (trading as Preh Elektrofeinmechanische Werke, J. Preh Nachfolger).—Trimming resistances. 30th April, 1959. (865503.)

15027. Atomic Energy of Canada, Ltd.—Monitoring system for determining the heavy water content of air. 1st May, 1959. (865433.)

18916. British Federal Welder & Machine Co., Ltd.—Welding cables. 3rd June, 1959. (865513.)

20858. Electro-Char Corporation.—Electric cooking apparatus. 17th June, 1959. (865375.)

22580. Marconi's Wireless Telegraph Co., Ltd.—Transistor amplifiers and detectors. 1st July, 1959. (865799.)

22996. Tornado A.G.—Electric suction cleaners. 3rd July, 1959. (865509.)

29764. Allmänna Svenska Elektriska A.B. —Self-locking electrical isolating switch. 1st September, 1959. (865888.)

29813. Minnesota Mining & Manufacturing Co.—Thermo-electric heat pumps. 1st September, 1959. (865890.)

34124. American Secretary of the Army. —Method of manufacturing cadmium electrodes for electric batteries. 8th October, 1959. (865894.)

41431. Allmänna Svenska Elektriska A.B. —Gland seals for gas-filled electrical machines. 7th December, 1959. (865605.)

1960

3816. Hallstrom, O. H.—Vacuum cleaning apparatus. 3rd February, 1960. (865757.)

23470. Mullard, Ltd.—Cathode-ray tubes. 4th June, 1957. (Cognate application 23471, 10th August, 1956.) (Divided out of 865663.) (865667.)

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 1st MAY

Arborfield.—Unit Cinema, R.E.M.E., 7 p.m. I.E.E. London Graduate and Student Section. "Aural Properties of Spaced Loudspeaker Systems," by J. B. Helder.

Birmingham.—James Watt Memorial Institute, 6.30 p.m. I.E.E. South Midland Centre. "Silicon Power Rectifiers," by A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams.

Bolton.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. "Refrigeration."

Ilford.—Angel Hotel, Broadway, 8.15 p.m. A.S.E.E. Essex Branch. "Electricity in the 'Ohm'," by Miss O. M. Price.

Leeds.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. Films evening.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. "Progress Report on the Development of a Photo-electric Beam Index Colour Television Tube and System," by R. Graham, J. W. H. Justice and J. K. Oxenham.

Norwich.—Assembly House, 7.30 p.m. I.E.E. East Anglian Sub-Centre. "Generator/Motor Problems in Pumped-Storage Installations," by J. H. Walker, and annual general meeting.

Sheffield.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Historical Water Power in the Don Valley," by G. F. Jones.

MONDAY, 1st and TUESDAY, 2nd MAY

London.—Kingsway Hall and Connaught Rooms. Electrical Association for Women. Annual conference.

TUESDAY, 2nd MAY

Belfast.—Civil Engineering Department, David Keir Building, Queen's University, Stranmillis Road, 6.30 p.m. I.E.E. Northern Ireland Centre. Annual general meeting.

Edgbaston.—Golf Club. Birmingham Electric Club. Golf competition.

Farnborough. — Farnborough Technical College, Boundary Road, 6.15 p.m. I.E.E. Southern Centre. "The Potentialities of Artificial Earth Satellites for Radio Communication," by W. J. Bray.

Leeds.—Leeds and County Conservative Club, South Parade, 6.30 p.m. I.E.E. North Midland Centre. Annual general meeting.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Electronics Sections. "Structural Properties and Applications of Evaporated Metal Films," by D. W. Pashley; and "Deposition of Evaporated Non-Magnetic Films," by J. R. Balmer.

Institution of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. Electrical Association for Women, London Branch. Caroline Haslett Trust Lecture, by Miss E. M. Ashburn.

Reading.—Southern Electricity Board, Vastern Road, 7.30 p.m. A.S.E.E. Reading and District Branch. Films.

TUESDAY, 2nd to SATURDAY, 6th MAY

Llandudno.—Institute of Metal Finishing. Annual conference.

WEDNESDAY, 3rd MAY

Halifax.—Crown Hotel, Horton Street, 7.45 p.m. A.S.E.E. Halifax Branch. "Solderless Connectors," by A. S. Ferguson.

London.—Eltham Green School, Queenscroft Road, Eltham, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. "Cables and their Uses," by A. Richardson.

University College, 3 p.m. British Institution of Radio Engineers, Computer and Radar Groups. Symposium on "Computer Control of Air Traffic."

Grosvenor House, Park Lane, W.1, 7 for 7.30 p.m. Iron and Steel Institute. Dinner.

Manchester.—Engineers' Club, Albert Square, 7.15 p.m. A.S.E.E. Manchester Branch. "Marine Electrical Auxiliaries," by J. H. B. Raw.

Middlesbrough.—Cleveland Scientific and Technical Institution, 6.30 p.m. I.E.E. Teesside Sub-Centre. Annual general meeting and "An Analytical Approach to Industrial Lighting," by W. Imrie-Smith.

Preston. — N.W.E.B. Demonstration Theatre, Friargate, 7.30 p.m. I.E.E. North Lancashire Sub-Centre. Annual general meeting and "Electronic Aids to Banking and Commerce," by R. Feinberg.

R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "Resins in Industry for Electrical Components," by H. Davies.

Sheffield.—Grand Hotel. I.E.E. Sheffield Graduate and Student Section. Annual general meeting and senior chairman's address.

WEDNESDAY, 3rd and THURSDAY, 4th MAY

London.—Institution of Civil Engineers, Great George Street, Westminster, S.W.1, 2.30 p.m. Institutions of Civil, Mechanical and Electrical Engineers. Railway Modernisation Conference: Papers by R. C. Bond, M. G. R. Smith, J. F. Harrison, S. B. Warder and G. F. H. Tyler.

Hoare Memorial Hall, Church House, Great Smith Street, S.W.1. Iron and Steel Institute and Institute of Metals. Joint symposium on "Structural Processes in Creep."

Institution of Mechanical Engineers, 1, Birdcage Walk, S.W.1. Iron and Steel Institute. Annual general meeting.

THURSDAY, 4th MAY

Hove.—New Imperial Hotel, 1st Avenue, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Production of a Technical Journal," by R. Baldwin.

FRIDAY, 5th MAY

Hanley.—Grand Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Plastics in the Electrical Industry," by A. J. J. Moulam.

Liverpool.—Industrial Development Centre, M.A.N.W.E.B., Paradise Street, 7.30 p.m. A.S.E.E. Liverpool and District Branch. "Particle Accelerators," by B. S. Halliday.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Medical Electronics Discussion Group. Discussion on "Artificial Muscles," to be opened by Dr. A. B. Kinnear Wilson.

Connaught Rooms, Great Queen Street, W.C.2, 6 for 6.30 p.m. Institution of Engineers in Charge. Fifty-sixth annual dinner.

FRIDAY, 5th to MONDAY, 8th MAY

Cornwall.—Carlyon Bay Hotel. I.E.E. Western Centre. Summer meeting.

SATURDAY, 6th MAY

Liverpool.—Cyclotron, University of Liverpool, Brownlow Hill. A.S.E.E. Liverpool and District Branch. Visit.

CATALOGUES AND LISTS

BUSBARS.—Booklet illustrating and describing high conductivity copper busbars.—**Enfield Rolling Mills, Ltd.,** Brimsdown, Enfield, Middlesex.

CONDUIT FITTINGS.—Net trade price list (18A) covering the range of "Blaco" conduit fittings.—**F. C. Blackwell & Co., Ltd.,** Musker Street, Liverpool, 23.

COUNTERS.—Illustrated leaflet dealing with electronic counters and batch counters.—**Londex, Ltd.,** Anerley Works, London, S.E.20.

ENGINE TESTER.—Leaflet dealing with the "Motorscope" test equipment for automobile engines.—**Crypton Equipment, Ltd.,** Bridgwater, Somerset.

FANS.—Illustrated booklet describing the range of "Metway" extractor, desk and ceiling fans.—**Metway Electrical Industries, Ltd.,** Canning Street, Brighton, 7.

FIXING DEVICES.—Catalogue (24 pages) covering the range of "Rawlplug" fixing devices.—**Rawlplug Co., Ltd.,** Cromwell Road, London, S.W.7.

FURNACES.—Illustrated brochure containing information on electric furnaces available for a wide range of industries.—**Metalectric Furnaces, Ltd.,** Cornwall Road, Smethwick.

Illustrated pamphlets on general purpose furnaces for hardening, annealing and similar processes.—**Wild-Barfield Electric Furnaces, Ltd.,** Otterspool Way, Watford By-Pass, Watford, Herts.

LAMPS.—Brochure describing the features of the high-wattage lamps produced by the company.—**Crompton Parkinson, Ltd.,** Crompton House, Aldwych, London, W.C.2.

MOTOR CONTROL GEAR.—Revised price list (200) covering motor control gear.—**J. A. Crabtree & Co., Ltd.,** Lincoln Works, Walsall, Staffs.

MOTORS.—Leaflet giving brief details of a range of servo motors and motor generators, etc.—**Evershed & Vignoles, Ltd.,** Acton Lane Works, Chiswick, London, W.4.

RESISTORS.—Brochure dealing with "F.P. Service" resistors for steelworks duty.—**Fawcett Preston & Co., Ltd.,** Bromborough, Cheshire.

SHOP BLINDS.—Leaflets dealing with electrically operated shop blinds.—**Electromatic Shopblinds, Ltd.,** 201, Eade Road, London, N.4.

VACUUM CLEANERS. — Illustrated brochure giving particulars of industrial type vacuum cleaning equipment.—**New Welbeck, Ltd.,** Moulsecoomb Way, Brighton, 7.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 19th May.

PEP (design). No. B788,415. Class 7. Pumps.—Precision Electrical Products (Stockport), Ltd., Progress Works, Lytham Street, Cale Green, Stockport, Ches.

Carbene. No. 809,789. Class 9. Electrical contacts.—Compagnie Industrielle des Métaux Electroniques, Paris. Address for service: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Adamin. No. 811,077. Class 9. Electrically heated soldering irons.—Light Soldering Developments, Ltd., 28, Sydenham Road, Croydon, Surrey.

Redifax. No. 813,488. Class 9. Instruments and apparatus for the production, transmission, reception or control of electric signals pertaining to drawings, printed or written matter, photographic images or other still pictures.—Redifon, Ltd., Carlton House, Lower Regent Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia. — P.M.G.'s Department, Melbourne. 13th June. Telephone receivers and parts. (E.S.B. 12967/61.)* 15th June. Telephone parts. (E.S.B. 13148/61.)*

Bridport.—Corporation. 25th May. Group "B" street lighting. (See this issue.)

Cheltenham. — Corporation. 24th May. Group "B" lighting installations. (See this issue.)

Durham.—County Council. 19th May. Electric lamps and miscellaneous appliances during the year ending 31st August, 1962. (See this issue.)

Greece.—N.A.T.O. Infrastructure Contract. 15th June. Power supply at four airfields. Applications by 11th May. (G.D. 1316/60 (27).)†

India.—India Supply Mission, Washington, D.C. 15th May. Condenser discharge flashing lamp unit. (See this issue.)

Rajasthan State Electricity Board. 25th May. 11 kV transformers; 110 of ratings from 100 to 1,500 kVA. (E.S.B. 12848/61.)* 30th May. 33 kV transformers; 63 of from 50 to 750 kVA. (E.S.B. 12852/61.)* 9th June. 11 kV metering equipment. (E.S.B. 12853/61.)*

Mysore State Electricity Board. 17th May. 3,000 electricity meters. (E.S.B. 12497/61.)* 30th May. Current communication equipment. (E.S.B. 12498/61.)* 7th June. Lightning arrestors. (E.S.B. 13499/61.)*

Iraq.—Ports Administration. 14th May. Refrigerators, water coolers and fans. (E.S.B. 12959/61.)*

Kirkham.—U.D.C. 30th May. Group "B" lighting, Freckleton Road. Surveyor, Council Offices, Kirkham, near Preston.

New Zealand.—Dunedin Corporation Electricity Department. 7th July. Two 10 MVA, 33/11·55/6·6 kV transformers. (E.S.B. 13162/61.)*

Nigeria.—Electricity Corporation of Nigeria. 9th June. Meters. (See this issue.)

Pakistan.—Directorate of Supply, Dacca. 9th May. Starters, e.l.c.b.'s and transformers. (E.S.B. 12879/61.)* Switches and switchgear. (E.S.B. 12877/61.)* 11th May. Lighting fittings. (E.S.B. 12876/61.)* 12th May. Office call equipment. (E.S.B. 12875/61.)* 17th May. Electrical equipment including plugs, lamps, caps, protectors, arrestors, and receivers and transmitters. (E.S.B. 12912/61.)*

Salvador. — Hydro-Electric Commission. 29th May. Generator. (E.S.B. 12862/61.)*

South Africa.—Durban Corporation. 19th May. Telephone switchboards and bells. (E.S.B. 13188/61.)*

United States.—Bureau of Reclamation. 23rd May. Three 47 MVA, 138/11·2 kV transformers. (E.S.B. 13185/61.)*

ORDERS PLACED

Cardiff.—Education Committee. Electrical installation work at Fairwater Grammar School for Boys (£9,114).—W. Edwards (Penarth). (In lieu of tender previously recommended.)

Durham.—County Education Committee. Electrical work at West Stanley Front Street Modern School (£1,800) and Catchgate County and Modern School (£926).—Williams Brothers (Electrical).

London.—West Metropolitan Regional Hospital Board. Electrical installation work in the new outpatients', casualty and x-ray departments at the Royal Northern Hospital (£40,342).—T. Clarke & Co.

Newcastle-on-Tyne. — Regional Hospital Board. Electrical work at hospitals: Prudhoe and Monkton Hospital.—Campbell & Isherwood (£8,398) and J. Scott (£13,570). West Hartlepool General Hospital (£2,517).—C. Horne & Co. Poole Hospital (£5,548).—Doves. Installation of telephone equipment, South Shields General Hospital (£4,490).—Communication Systems (in place of previous contractors).

Stockton-on-Tees.—Corporation. Electrical installation in new Fairfield Secondary Modern School (2nd instalment) (£3,601).—Williams Brothers.

Sunderland.—Corporation. Replacing or modifying radio-telephone systems in ambulances, and installing mobile sets in two additional ambulances (£2,216).—Pye Telecommunications.

Swindon.—Corporation. Electrical re-wiring and improvements at Ferndale Infants' School (£1,280).—Teesdale & Jones.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Alexandria (Dumbartonshire).—Maternity hospital on site adjoining Vale of Leven Hospital; J. Gleave, architect, Woodside Place, Glasgow.

Billingham-on-Tees.—Shops, warehouse, etc., for C.A.S. Industrial Developments, Ltd.; Llewellyn Smith & Waters, architects, 103, Old Brompton Road, London, S.W.7.

Croydon.—Development scheme, Mayday Hospital (£250,000); Philip Evans & Partners, surveyors, 6/8, Sackville Street, W.1.

Erection of offices, 11 and 15, Dingwall Avenue (£90,000); W. Robbins, architect, 77, Wigmore Street, London, W.1.

Dagenham.—Dwellings (52), Oxlow Lane; borough engineer.

Dewsbury.—Fire station; G. Alan Burnet, architect, 8, Blenheim Terrace, Leeds, 2.

Durham.—Second stage of proposed R.C. primary school at Gilesgate; A. Rossi, architect, 88, Medomsley Road, Consett, Co. Durham.

Flats (20), Oswald Court; city engineer.

Erection of five shops and restaurant on site of Criterion Hotel; J. S. Beardshaw & Partners, architects, 38, Bury Street, St. James's, London, S.W.1.

Epsom and Ewell.—Houses (24), The Kingsway, Ruxley Lane and West Ewell; borough engineer, The Parade, Epsom.

Glasgow.—Shop and office block, 110/114, Bath Street; Humphrey & Lipski, architects, 13/14, Cork Street, London, W.1.

Goole.—Houses (28), Rawcliffe Bridge; surveyor, Council Offices, Boothferry Road, Goole, Yorks.

Gravesend.—Dwellings (143), Singlewell estate; borough engineer.

Hampshire.—Fire stations, Eastleigh (£68,000), and Wickham (£12,000); county architect, County Hall, Winchester.

Harlow.—Waterhouse Moor County Infants' School (£52,143); H. Conolly, county architect, County Hall, Chelmsford.

Hereford.—R.C. school, Belmont Road; F. R. Bates & Son, architects, Imperial Buildings, High Street, Newport, Mon.

Hornsey.—Fire station, Priory Road/Park Avenue South site; Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Hove.—Flats (48), Hangleton Way; borough engineer, Town Hall.

Hull.—Chemical factory; Wm. Pearson, Ltd., Clough Road.

Huntingdon.—Proposed bus station; borough surveyor.

Jarrow.—Houses (325) in overspill area; H. W. T. Perkins, borough engineer.

Leeds. — Extensions, Woodsley Hall (£60,000), for University; Chamberlin, Powell & Son, architects, Avenue Studios, Sydney Mews, London, S.W.3.

School, Potternewton; city architect.

Newbury.—Houses (106), Turnpike Road estate; borough surveyor, Municipal Buildings.

North Riding.—Branch library, Marske (£17,000); county architect, County Hall, Northallerton.

Northumberland. — Teachers' training college on the site of Ponteland Cottage Homes; county architect, 30, Great North Road, Newcastle-on-Tyne.

Portsmouth.—Youth centre, Paulsgrove (£69,300), and junior school, Battenburg Avenue, North End (£80,740); city architect, Guildhall.

Quorn.—Extensions to Rawlins Grammar School (£20,000); county architect, Leicester.

Reading.—Aged persons' home, Granville Road, Southcote estate (£71,500); R. Unsworth, quantity surveyor, 25, Queen Victoria Street, Reading.

Redruth.—Factory, Pool Road; Tecalemit, Ltd., Plymouth.

Smethwick.—Dwellings (373), Kingsway, Oldbury; borough engineer.

Stockton-on-Tees.—Old people's flatlets, Hardwick estate (£34,000); borough architect, 28, The Square.

Sunderland.—Shops, etc., on the site of the Palace Cinema, High Street West, for London and Northern Properties, Ltd., 5, Benton Terrace, Newcastle-on-Tyne; Marshall & Tweedy, architects, 36, Blackett Street, Newcastle.

R.C. primary school, South Hylton; Stienlet & Son, architects, Queen Square, Newcastle-on-Tyne.

Swindon.—Housing estate, Whitworth Road; Edwin H. Bradley & Sons, Ltd., Okus Quarries.

Tottenham.—Dwellings (112), including one block 13-storeys high, Markfield estate; borough engineer, Town Hall, N.15.

Tynemouth.—Additions comprising another 40 bedrooms, dining hall, and ballroom at the Grand Hotel; Arthur & Kirkup, architects, 13, Swinburne Street, Gateshead.

Wallasey.—Three five-storey blocks of flats and maisonnettes, Twickenham Drive; borough architect, Brighton Street.

Wallingford. — Extensions (£300,000), Carmel College; Tom Hancock, architect, 1, Church Lane.

Washington (Co. Durham).—Houses (42), Village Lane; T. E. Crowe, U.D.C. surveyor.

Wood Green.—Two-storey extension to departmental stores, High Road; staff architect, Marks & Spencer, Ltd., 82, Baker Street, London, W.1.

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* This information is extracted from the Board of Trade *Export Service Bulletin.* Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. †Telephone: Trafalgar 8855, Ext. 2010.

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with greater efficiency . . . more productivity and VALUE FOR MONEY

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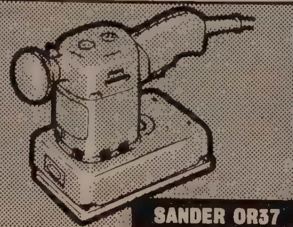
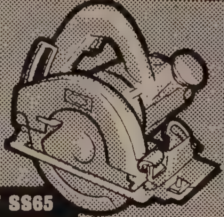


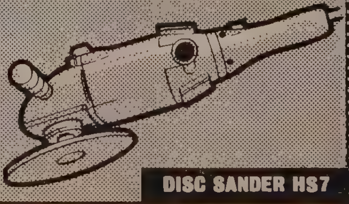
SANDER OR37

1/4 in. DRILL OK2c



6.1/2 in. SAW SS65

3/8 in. DRILL OK3c



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1st PERFORMANCE RELIABILITY VALUE

EIGHT PORTABLE POWER TOOLS—THE BEST VALUE MONEY CAN BUY

Now incorporating the improvements of the most advanced production techniques for even greater reliability.

The lowest priced machines of their calibre.

Recognised by their distinctive BLUE finish : appreciated for their unrivalled high productivity.

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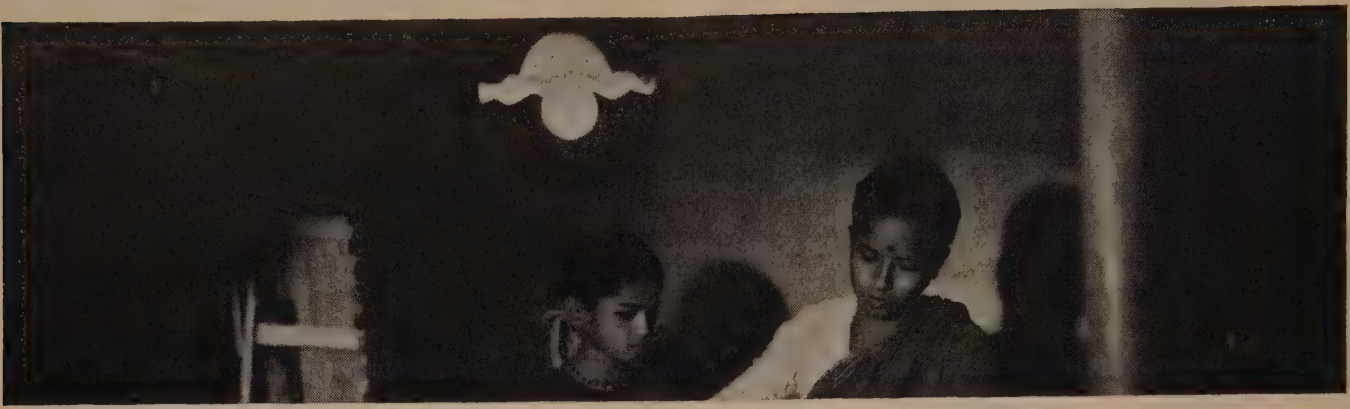
REPORT ON COMPANY MEETING OF ASSOCIATED ELECTRICAL INDUSTRIES LIMITED



In any general expansion of industry or national prosperity...

THE ELECTRICAL INDUSTRY MUST BE IN THE FOREFRONT

Lord Chandos Chairman of Associated Electrical Industries

An electron microscope and the image intensifier. First of its kind, the image intensifier presents on a television screen a greatly intensified image of the specimen.

Reviewing the financial results for the year 1960, Lord Chandos, Chairman, at the Annual General Meeting said: The trading profit, after tax, was virtually unchanged at £4,722,000 compared with £4,747,000 last year.

The total Stockholders' capital employed in the business is £138,906,000, the equity capital is £133,120,000, against the nominal figure of £42,828,000. The 3/- Ordinary dividend represents a return on the equity capital of slightly under 5%.

TURNOVER UP — RECORD ORDER BOOK 1960

The order book is a record. Compared with last year the orders received increased from £182m. to £223m. Our turnover increased from £208m. to £215m., and orders in hand have increased from £173m. to 181m.

The volume of exports by the electrical and allied industries amounted to no less than £293m. in 1960, and this represented 10% of the total export manufactured goods from the United Kingdom. A.E.I. has made a notable contribution to this figure, and there has been a small increase of about £3m. in the value of A.E.I. exports over the corresponding figure for 1959.

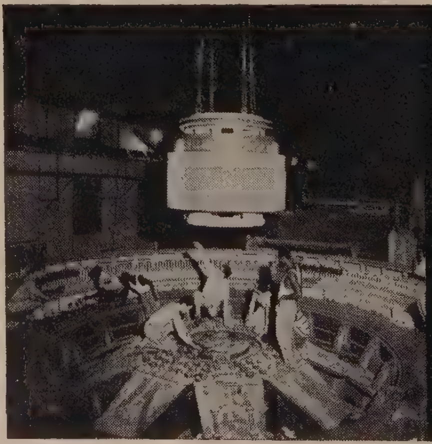
LEADING WORLD EXPORTS OF STEAM TURBINE GENERATORS

After reviewing the Group's manufacturing operations overseas, Lord Chandos said: Exports, in a country of 53 million people, with meagre indigenous resources of raw materials, are vital to the economy. It is rather a striking fact that in 1960 AEI's total export orders for steam turbo-alternators was more than that of any individual manufacturer in the world, and greater than those of all the other manufacturers in this country put together. We are naturally striving to ensure that this situation will continue, but even if it does not, I think an occasional toot on our own trumpet is not out of place. The export business has been highly competitive, margins have been inadequate, and these conditions are likely to continue in 1961.

PROSPECTS FOR 1961

I cannot see any general expansion in industry or in national prosperity, either in this country or in any other, unless the electrical industry is in the forefront of the growth.

The outlook for those parts of our business which are predictable is much better than it was in 1960, and I expect more favourable results in 1961 from the majority of our Divisions. We regard the longer future with undiminished confidence.



At the heart of the Kariba Dam are six generators—the largest in Africa. These and £2½ million worth of switchgear and cable were supplied by AEI.

15 PRODUCT DIVISIONS AND PRINCIPAL TRADING COMPANIES IN THE U.K. AND MORE THAN 20 COMPANIES OVERSEAS

Associated Electrical Industries Limited AEI

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HOME & EXPORT

BRASS & COPPER CABLE SOCKETS

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BRASS CABLE CONNECTORS

PACKING GLANDS Brass. Nylon. Diecast.

COPPER CLAMPING WASHERS

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BUCKLE CABLE CLIPS

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INTERLOCKING INSULATING BEADS

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LEAD HEADED WALL NAILS

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PLASTIC CLIP-ON CABLE CLEATS

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WRITE FOR CAT. NO. OHS/6ER.
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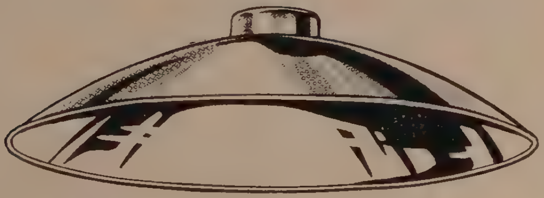
as well



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UP TO 36″ DIAMETER

pressings of all types

We have installed new plant to enable us to extend our service to the electrical trade.

Deep Drawing up to 8″ depth. Finishes as required.

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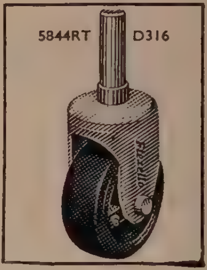
ONE MAN WENT TO MOVE...

Yes, one man is all you need. Once you fit Flexello double ball-bearing all steel castors to your trolleys and other equipment, one man can move with ease what it took four to drag before. The stout kingpin of Series 44 is adjustable for wear. Flexello Series 44 Castors give extra mobility, strength and economy. They are available in a variety of wheels and tubular fittings. Zinc plated rust-proof finished. Fit your equipment with Series 44 Flexello Constant Quality Castors and get things moving.

B544RT/PSIBSP Pipe socket fittings supplied with gas thread for outside fitting.
B544RT/STIBSP Threaded stem and BS male pipe fitting.

◀ Rigid embossed steel pressings.
◀ Substantial kingpin, adjustable for bearing protection.
◀ Minimum of maintenance.
◀ Pre-greased hardened bearings.
◀ Maximum ease of mobility.



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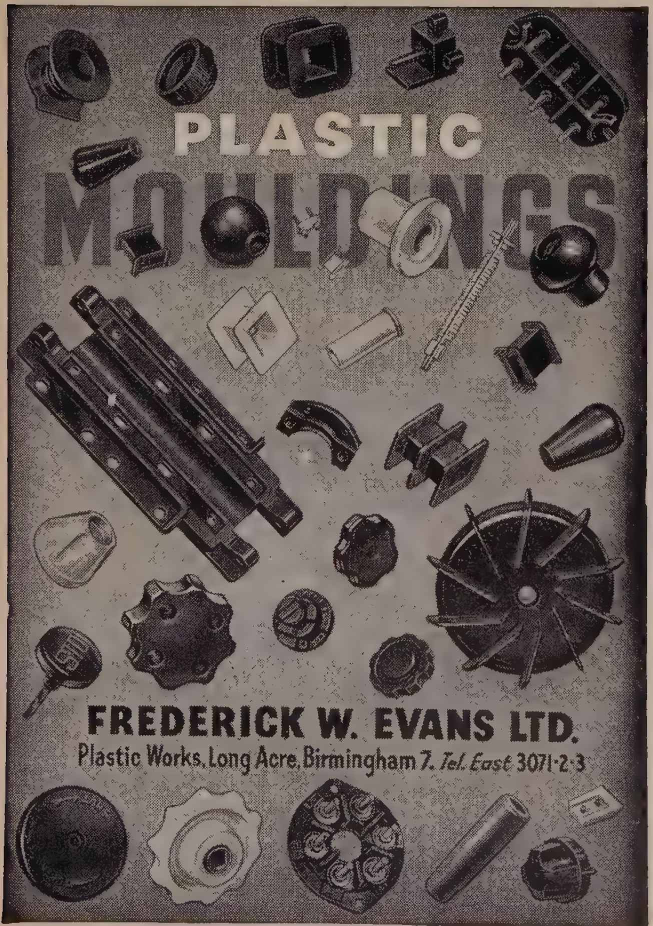
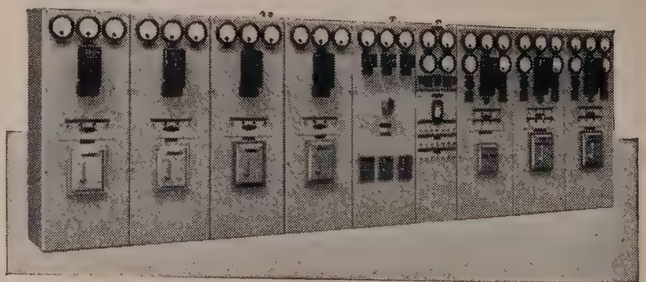


SPECIAL SWITCHBOARDS AND ELECTRONIC CONTROL PANELS

Below is shown a multi-control and feeder panel with push button circuit breaker control and metering equipment for a 1000 kVA substation. It incorporates electronic timers for process timing of a number of machines in a large factory engaged on automation.

★ *Hampson will design and make any control panel to suit any requirements.*



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ASBESTOS BASED CYLINDERS FOR CLASS H AND CLASS C INSULATION

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Information on the various "Siluminite" Class H and Class C products including Electrofine Paper and Silicone Resin Bonded Electrofine Laminates, may be obtained by application to the Electrical Insulation Department.

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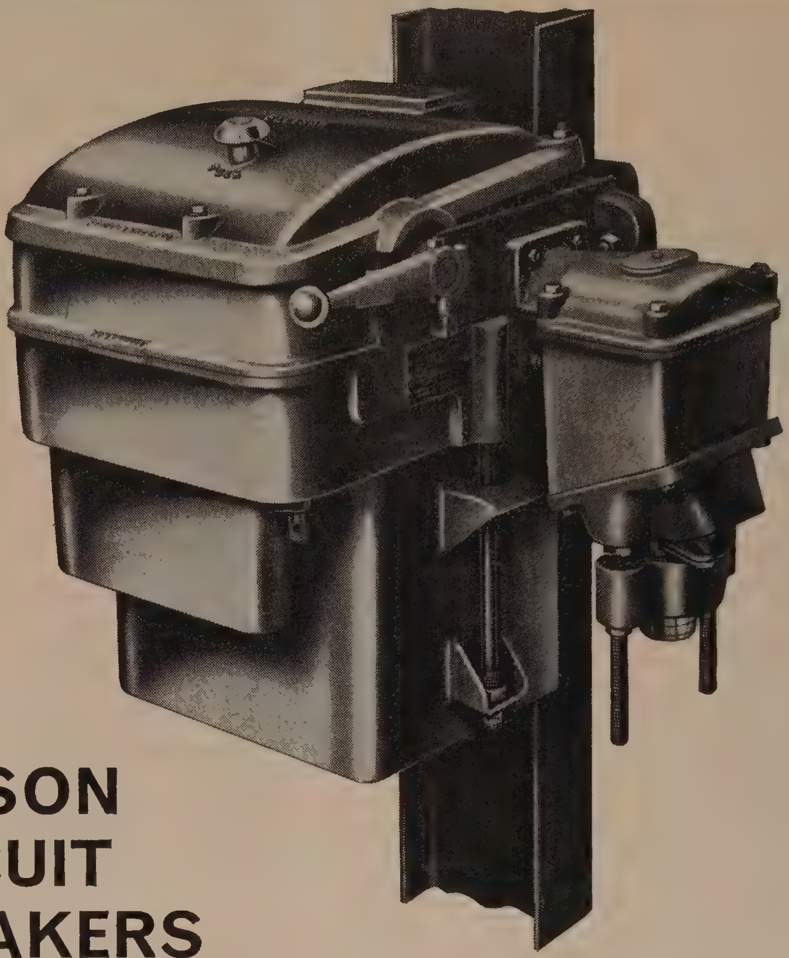

ELLISON CIRCUIT BREAKERS

the best insurance premium you ever paid

When you invest in an Ellison Circuit Breaker you are, in fact, paying a premium for long-term insurance—insurance against breakdown, disruption of production, increased costs, unfulfilled orders. A premium for complete protection of operator and plant and trouble-free service over the years.

The traditional skill of Ellison craftsmen allied to advanced design assures you of this. Modern production methods ensure speedy delivery.

Ellison Circuit Breakers may cost a little more but it is equipment which depreciates only in your balance sheet!

GEORGE ELLISON LIMITED

TRADE MARK PERRY BARR · BIRMINGHAM 22B

One of the ship's officers of s.s. Oriana (P&O Orient Lines) takes a bearing on the latest Sperry Repeater and Azimuth Circle

Photograph by courtesy of P&O Orient Lines and Sperry Gyroscope Co. Ltd., Brentford, Middlesex.

They take their bearings . . .

Navigators, plotting their courses across the ocean, rely implicitly upon the accuracy of the references they take from their gyro-compasses and ancillary equipment which, in three out of four of the world's merchant ships, bear the name SPERRY.

SPERRY GYRO-COMPASSES and navigational instruments, accurate and sensitive as they are, require bearings of the highest standard . . . HOFFMANN ball bearings are used extensively and help the mechanisms to function consistently and reliably over long periods, often under exacting conditions.

Section of a typical Hoffmann ball journal bearing as used for gyro applications where the speed of the rotors is in the region of 6,000 r.p.m.

HOFFMANN

BALL AND ROLLER BEARINGS

THE HOFFMANN MANUFACTURING CO. LTD.,
CHELMSFORD, ESSEX. TEL.: 3151 TELEX: 1951

Getting down TO LIGHTING MAINTENANCE

L.E.F. Raising and Lowering gear is the perfect answer to every problem posed by interior lighting installations in which the fitting must of necessity be out of reach and, consequently, tricky to service.

This gear enables maintenance staff to bring lighting fittings down to floor level, so that they can be dealt with quickly and conveniently. It out-dates cumbersome methods and is economical in time and labour.

When you have a lighting problem, remember that it is most important to discuss your needs with L.E.F. at the planning stage; first to specify your technical requirements and secondly, to ensure suitable delivery.

L.E.F. RAISING & LOWERING GEAR

LONDON ELECTRIC FIRM LTD.

Brighton Road, South Croydon
Surrey
Telephone: Uplands 4871

Lighting units, each weighing over 2 cwt., are serviced by means of L.E.F. Raising & Lowering Gear at the Leysian Mission Hall

Tib 134A

Photograph reproduced by kind permission of the Switchgear Division of Associated Electrical Industries Ltd.

In power stations and substations, on transmission lines and switchgear, the familiar "chocolate soldiers" form part of each characteristic skyline. They stand, sentinels of safety, examples of the combination of engineering know-how and the ancient craft of the potter, which give Taylor Tunnicliff a wealth of background experience unsurpassed in this specialised industry.

No project is too large or too difficult for us to consider, and our record of success in solving problems of great complexity and magnitude leads us to believe we shall solve many more. We should like to hear about yours — preferably at an early stage of the designs.

Daily proving their insulating qualities the world over!

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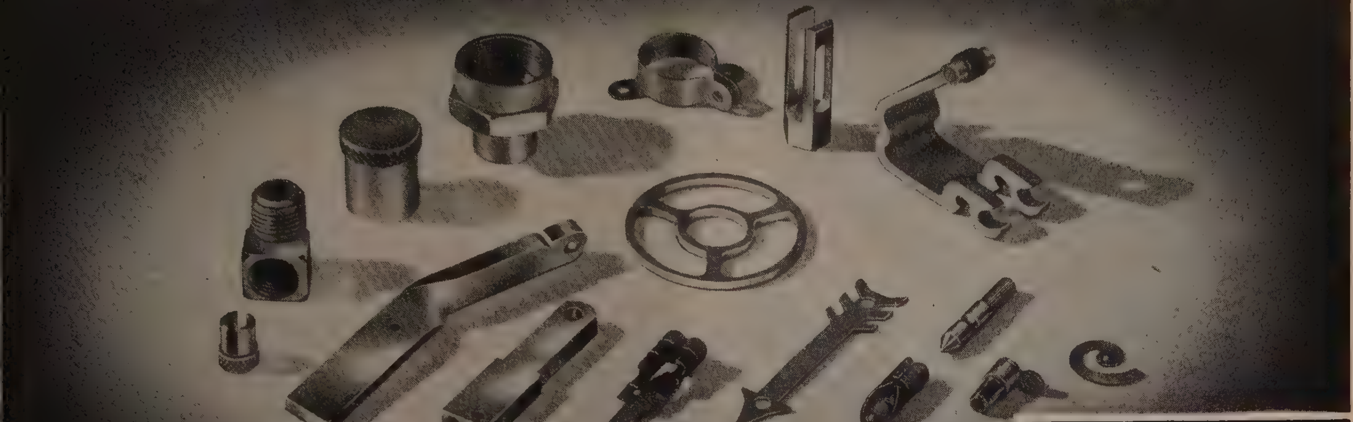
METAL PARTS



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REPETITION PARTS, MACHINING, SMALL CASTINGS, PRESSINGS, PIPE FITTINGS, CLIPS, TERMINALS, SOCKETS, UNIONS, SPRINGS, CONTACTS, EYELETS, LUBRICATORS, TAGS, NIPPLES, ADAPTORS, WING-NUTS, LUGS, CLEATS, FLEXIBLE CONNECTORS, SPECIAL WASHERS, COMPLETE ASSEMBLIES

In fact :—

Anything Small in Metal
FOR ANY TRADE

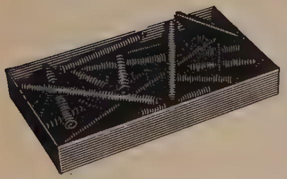
PAXTONS (ELECTRICAL) LTD.
A.I.D. and A.R.B. Approved
WESTON-SUPER-MARE

Phone : 1357
Grams : 1357

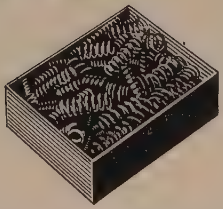
HALF A DOZEN OR HALF A MILLION!

EXPERIMENTAL SPRINGS?

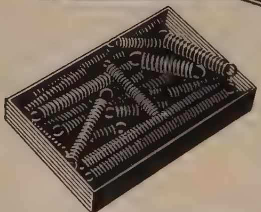
No. 1217
One gross Assorted Springs.
42/-



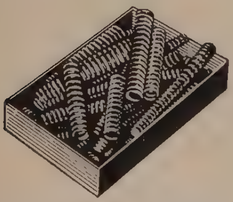
No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. **15/-.**



No. 98A. Three dozen Assorted 1″ to 4″ long, ½″ to ¾″ diam., 19G to 15G. **6/6.**

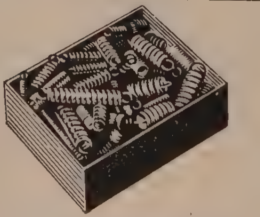


No. 753. Three dozen Assorted Light Expansion ¼″ to ½″ diam., 2″ to 6″ long, 22 to 18 S.W.G. **12/-.**



No. 760. Three dozen Assorted Light Compression Springs. 1″ to 4″ long, 22 to 18 S.W.G., ¼″ to ½″ diam. **7/6.**

No. 757. Extra Light Compression, 1 gross Assorted, ⅛″ to 7⁄16″ diam., ½″ to 2½″ long, 27 to 19 S.W.G. **18/-.**



No.758. Fine Expansion Springs. 1 gross Assorted ⅛″ to ⅜″ diam., ½″ to 2″ long, 27 to 20 S.W.G. **18/-.**

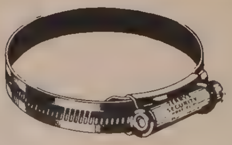
That spring you want . . . in a hurry . . . *where* is it? Pick *what* you want *when* you want it from TERRY'S BOXES OF ASSORTED SPRINGS—our fine range of small boxed assortments of experimental springs. We can show you only a few from the range here. Send a postcard for our full list—and if ever you're stuck with a spring problem send it along to our Research Department—they'll gladly help you out.

Have you a Presswork problem?

If so, the help of our Design Staff is yours for the asking.

Really interested in Springs? "Spring Design and Calculations" 10th Edition tells all—post free 12/6.

Cut Production Costs with Terry's Wire CIRCLIPS. We can supply immediately from stock—from ⅛″ to ⅝″.



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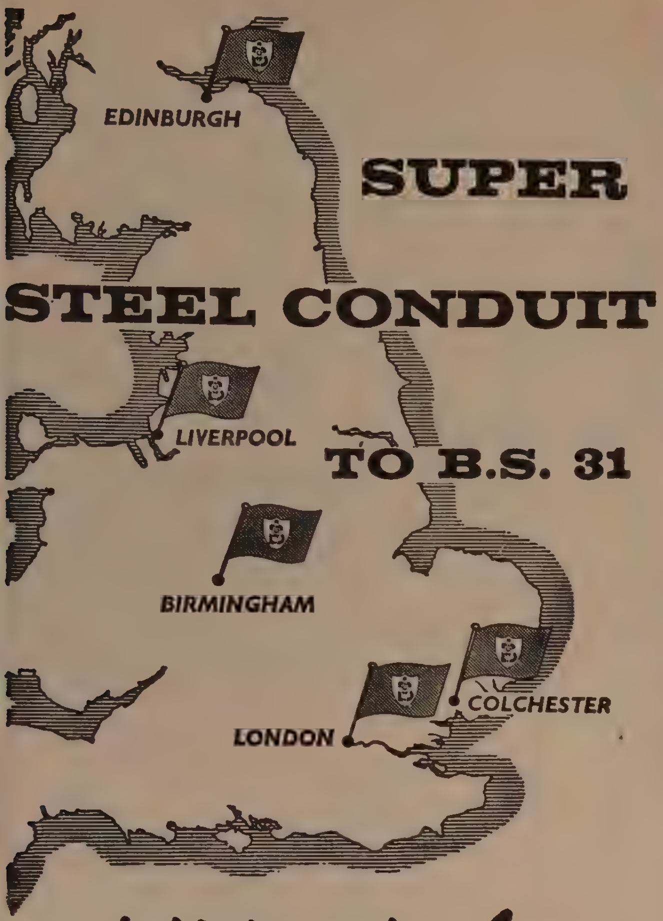
Redditch, Worcs.

(Makers of Quality Springs, Wireforms and Presswork for over 100 years)

HT31



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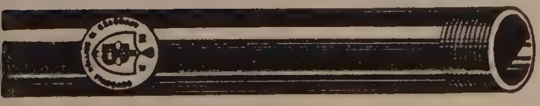
A Nation Wide Service

. . . from five industrial centres strategically placed to give immediate attention to customers' requirements in all parts of the country. Burn conduit, made to an unvarying high quality, is furnace welded for easier bending. Light and heavy gauges are available in a full range of diameters ⅜″ to 2½″ and a variety of finishes. Write now for the name of your nearest wholesaler.



EDINBURGH *33 Westgarth Avenue, Edinburgh 13*
Telephone: Colinton 88113

LIVERPOOL *24 Chapel Street, Liverpool 2*
Telephone: Central 7012

BIRMINGHAM *City Tube & Conduit Mills, Smethwick, Birmingham*
Telephone: Smethwick 1511 (5 lines)

LONDON *2 Deansway, London N.2*
Telephone: Tudor 7287

EASTERN COUNTIES *23 Church Road, Kelvedon, Colchester, Essex*
Telephone: Kelvedon 267

GEORGE BURN LIMITED

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City Tube & Conduit Mills,
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MERCURY VAPOUR CONCENTRATION METER Type E3472

Measures concentration of mercury vapour present in air. Essential where quantities of mercury are regularly used or where danger exists of leakage of mercury vapour from apparatus.

Two sensitivities are available at the touch of a switch, giving either full scale reading at a concentration of 770 micro-grammes per cubic metre of air or full scale meter reading at a concentration of 200 micro-grammes. Terminations are provided at rear for operation of a recorder to give continuous readings of concentration present.

Hendrey Relays

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Telephone: Burnham 609/611
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CONTROL AND LABORATORY APPARATUS
On Admiralty, Principal Ministries and Post Office Lists. A.I.D. & A.R.B. Approved.

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It is the blending of these merits
that has produced superb ranges of switchgear.
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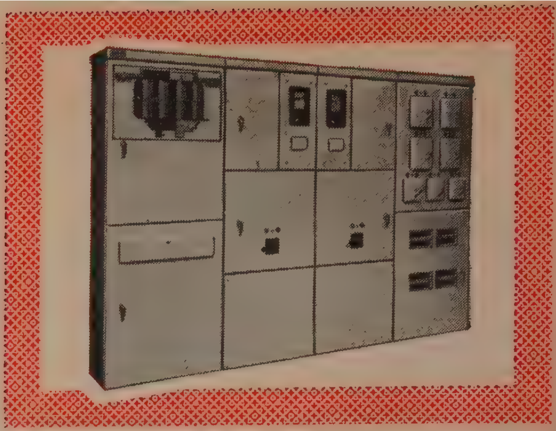
control gear, along with circuit-breakers,
etc., can be assembled to satisfy
your needs for every industrial and
commercial requirement.
Simplex design service is always at your
disposal from a simple switchboard
to the most complicated
made-to-measure task.



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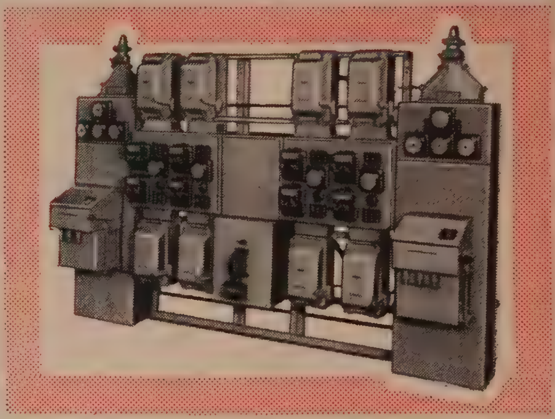

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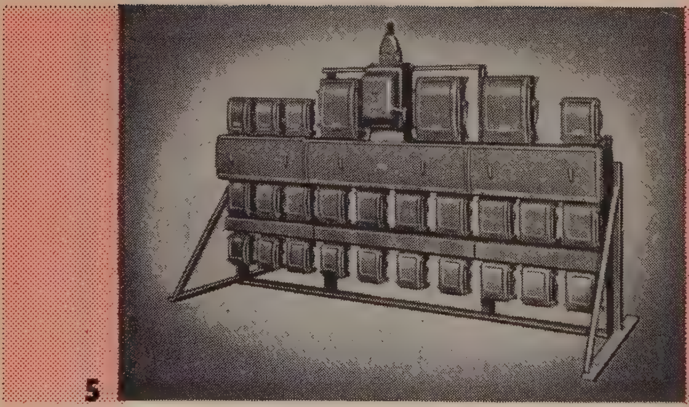

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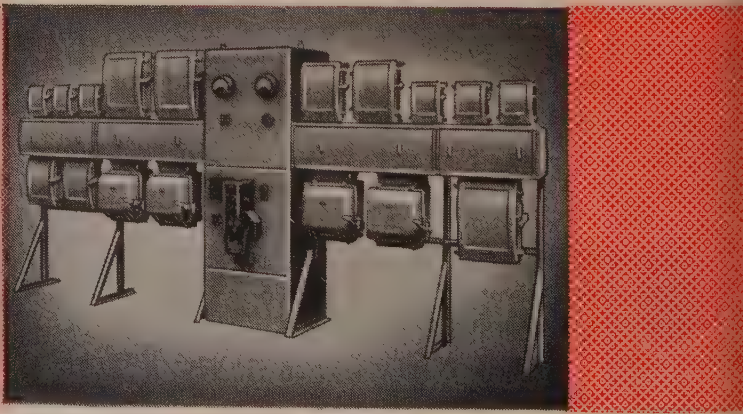


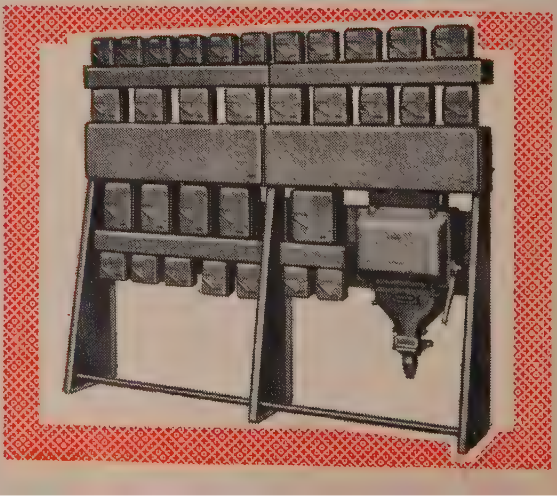
6

ELECTRICAL DIVISION

Simplex

SIMPLEX ELECTRIC COMPANY LIMITED
CREDA WORKS, BLYTHE BRIDGE, STOKE-ON-TRENT, STAFFS.
Branches throughout Great Britain and Agents throughout the World

S.I.A



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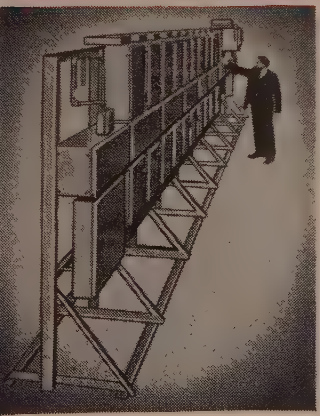

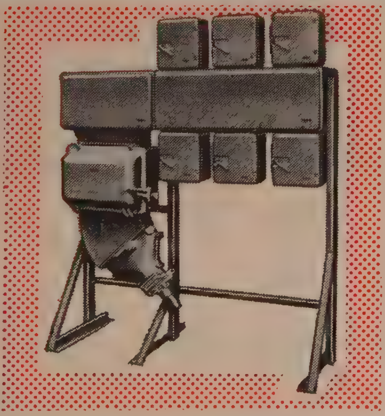

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9

1 Cream coloured cubicle type Switchboard, incorporating mimic diagram of floor-warming circuits, made up of Star and S & S installation switches controlling all electrical services at a dock's reception area.

2 Star Monarch and Automatic Control Gear switchboard designed to control all services (and Floor-warming) for a Comprehensive School, Menai.

3 Specially designed switchboard incorporating Monarch units supplied to a Gas Board.

4 Multi-tier Star switchboard with incoming Monarch unit controlling kitchen in a Commercial Building, Birmingham.

5 Multi-tier Regent switchboard with Monarch incoming unit for an International Airport.

6 Switchboard built up with Regent and Monarch units designed for a Bristol Factory.

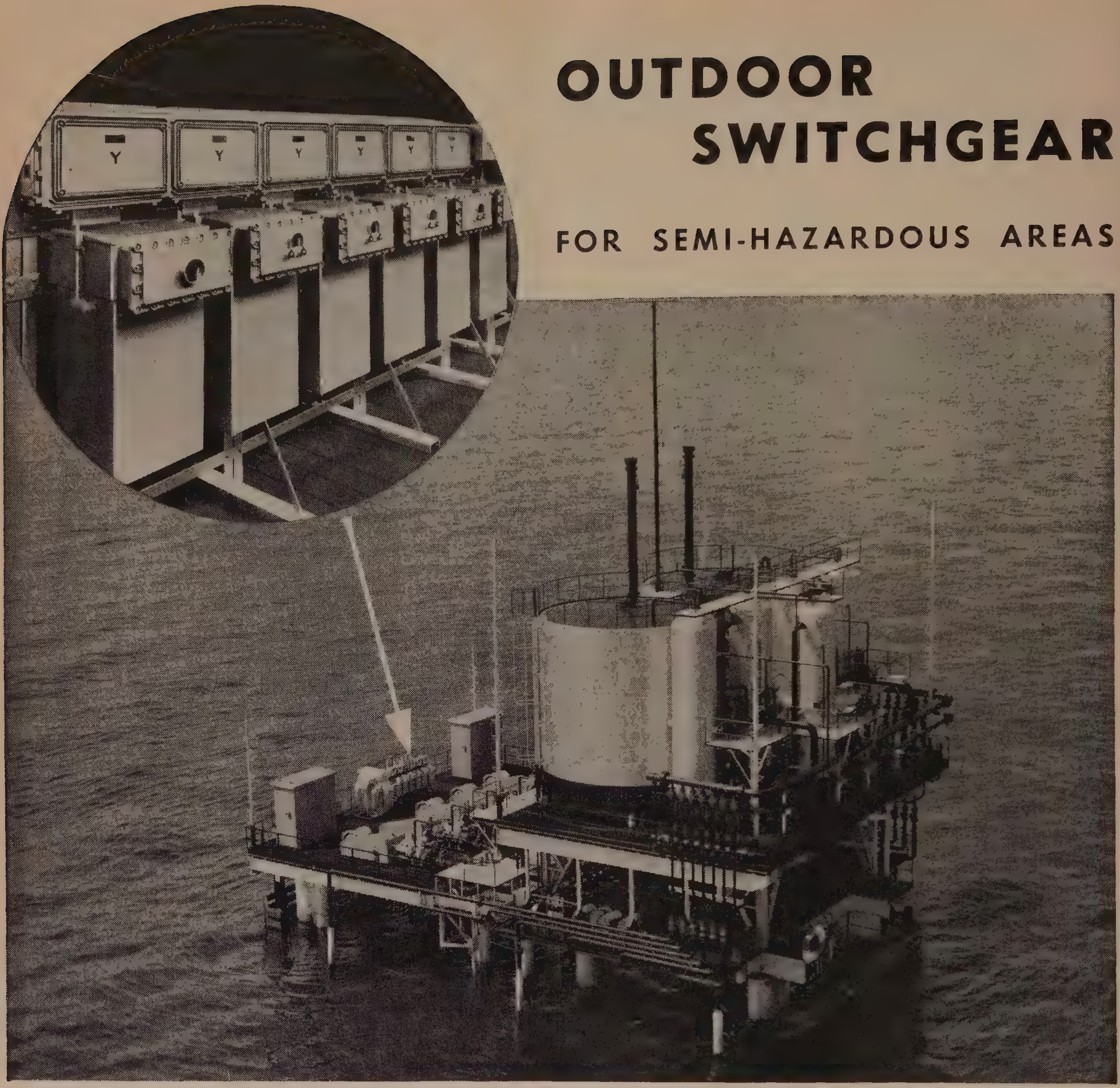
7 Busbar mounted multi-motor starter-board for an oil refinery.

8 Star switchboard with Monarch incoming unit (with angled sealing chamber) supplied to a factory.

9 Multi-motor control cubicle for an oil storage installation, London.

OUTDOOR SWITCHGEAR

FOR SEMI-HAZARDOUS AREAS



Photograph by courtesy of Shell International Petroleum Co. Ltd.

One of a large number of Motor Starter Switchboards, non-sparking, installed 15 miles off-shore on Oil Gathering Stations in Lake Maracaibo (salt water) Venezuela. These switchboards are completely weatherproof and operate under the most exacting climatic conditions conceivable.

ELECTRO MECHANICAL MFG. CO. LTD.

Head Office and Works : Marlborough Street, SCARBOROUGH
Telephone : Scarborough 2715-6

London Office and Showroom : 133-135 Grand Buildings, Trafalgar Square, LONDON, W.C.2
Telephone : Whitehall 3530

Subsidiary of Yorkshire Switchgear and Eng. Co. Ltd.

Quality at the Dog Show, Prize Poodle (Photo Thomas Fall)

CRYSELCO

lamps and fittings can be obtained from any of fourteen branches and depots throughout the country.

All CRYSELCO business is based upon a policy of Quality and Service.

This attention to detail in production and distribution, coupled with more than 60 years' experience in lamp manufacture, ensures quality products, promptly delivered.

The range of lamps and fittings available is extensive. If you have not received the current catalogue, please send for one today.

QUALITY and SERVICE

CRYSELCO BRANCHES

are situated throughout the country.

Their aim is to give you quality products plus good service.

CRYSELCO Managers in the following towns and cities would be pleased to hear from you.

COL. CHRIS ELCO
OF THE CRYSELCO LIGHT BRIGADE

BEDFORD
BIRMINGHAM
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MANCHESTER
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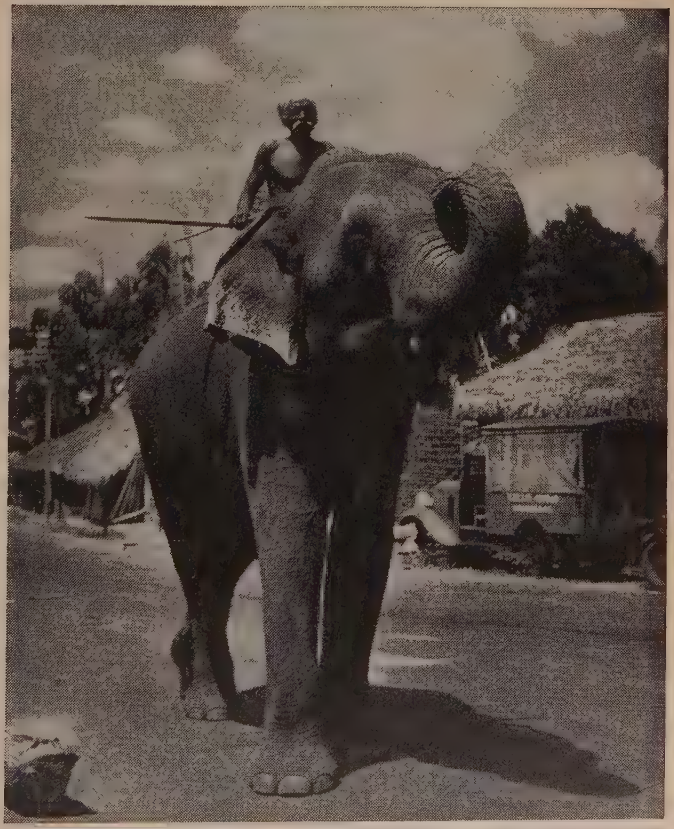
CRYSELCO LIMITED
KEMPSTON WORKS BEDFORD



Service by Elephant, Ceylon (Photo J. Allan Cash)

Cold Headed Bolts and Set Screws

Why look elsewhere, when all the benefits of long specialization plus the closest adherence to exacting quality standards are so conveniently available. Let ORMOND quote for all Repetition Parts—for single and multi spindle automatics up to 1¼″ diameter; Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, Grub screws, Nuts, Allthreads, Hexagon Bolts and Set screws turned from bar and Cold Headed Grades "A", "B" and High Tensile.

THE ORMOND ENGINEERING CO. LTD.
Ormond House · Rosebery Avenue London, E.C.1
Telephone: TERminus 2888 Telegrams: "Ormondengi, Cent."

rugged robust reliable

plus all the accuracy you need

Typical 4″ watertight square flange mounting r.p.m. indicator with a novel form of prismatic illumination

SMITHS electric tachometers

Once you fit a SMITHS Electric Tachometer you can forget it. They are really rugged units which stand up to the toughest assignment. Day-in, day-out they'll indicate rotational speed and directly related functions such as Cutting speeds, Conveyor speeds, Rate of printing impressions, etc. A wide range of Indicators and single, three phase a.c., or direction-sensitive d.c. Generators are available.

Generators may be interchanged without Indicator re-calibration.
Multi-Channel Recorders can be provided.
Two Indicators can operate from one Generator.
Automatic Control, at predetermined speeds, can be included.

fit and forget | SMITHS electric tachometers

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SMITHS INDUSTRIAL DIVISION

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The industrial business of
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including the marketing of
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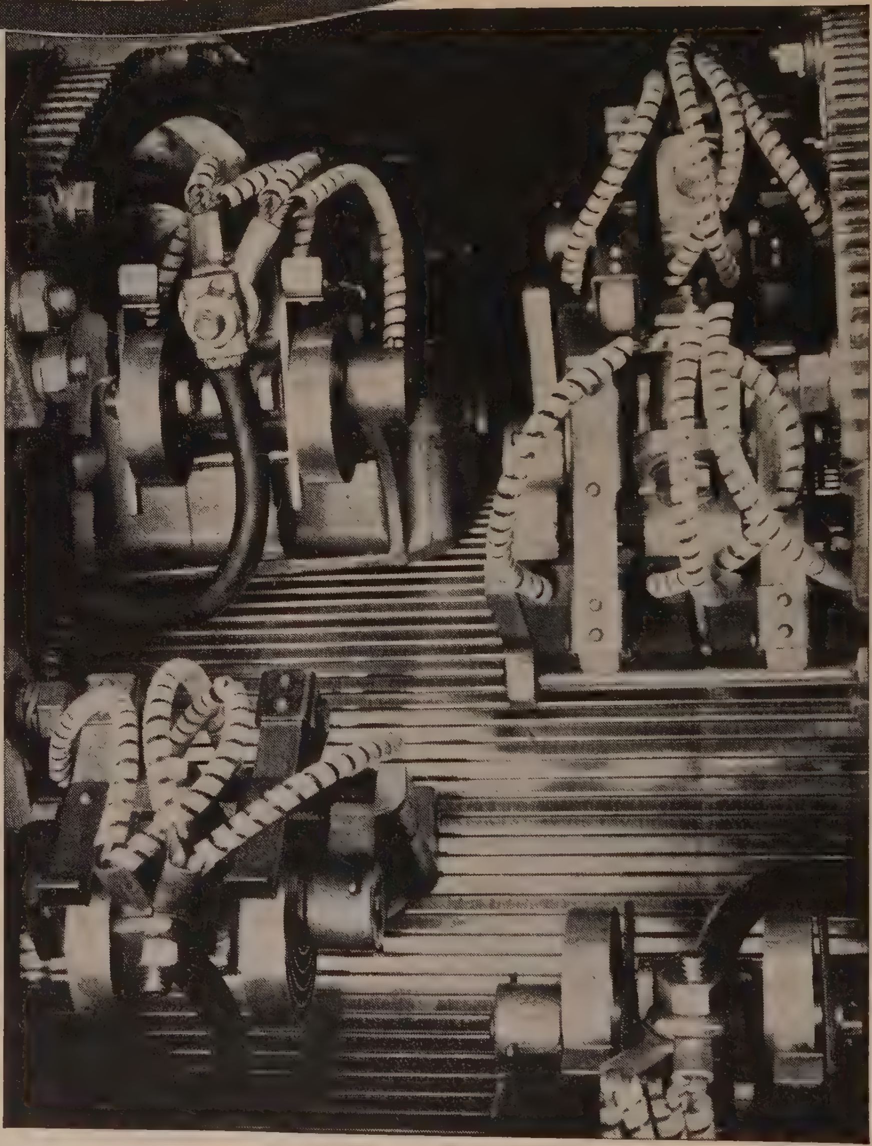
Self-contained variable-speed THREE-PHASE A.C. MOTORS



IMPORTANT ADVANTAGES

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Stepless variation, with unlimited speed ratios. No external regulator. Wide speed range, with reverse operation when required. Speed variation may be by hand, remote or servo control.

High Performance

Good shunt characteristics at all speeds, whether motoring or generating. High efficiency and power factor throughout top half of speed range. High starting torque with low starting current.

Good Delivery

Motors between 20 and 100 h.p. are built from stock parts ensuring short delivery times.

Write for further information to:

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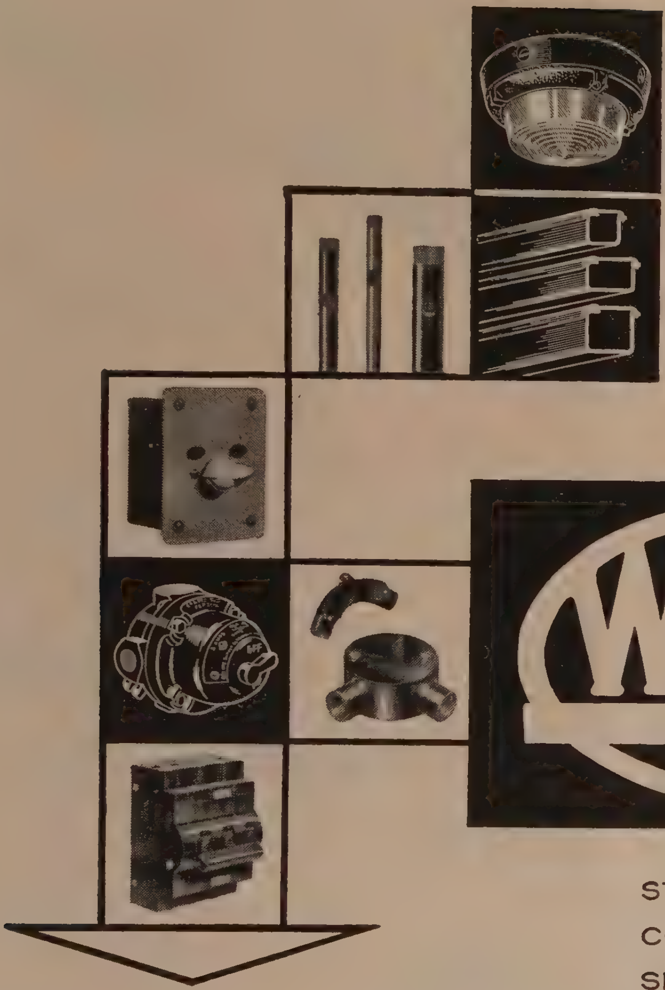
(FOR MOTORS OF 20 H.P. AND UPWARDS)
Medium Electrical Machine Sales,
Heavy Plant Division,
RUGBY.

AEI **Associated Electrical Industries Limited**

EVERYTHING
for
the
electrical
installation



Walsall

- STEEL CONDUIT
- CONDUIT FITTINGS
- SPECIALITIES
- FLAMEPROOF EQUIPMENT
- ACCESSORIES
- MINIATURE CIRCUIT BREAKERS
- FLUORESCENT LIGHTING FITTINGS
- CABLE TRUNKING SYSTEMS
- UNDERFLOOR DUCT SYSTEMS
- SHALLOW DEPTH SCREEDUCT
- SWITCH AND FUSE GEAR
- BUS-BAR CHAMBERS
- DUST-TIGHT EQUIPMENT
- TUBULAR HEATERS

**WALSALL
CONDUITS
LIMITED**

EXCELSIOR WORKS · WEST BROMWICH
'PHONE: TIPTON 1171 (8 LINES)

CRATER are **FIRST AGAIN** with the **NEW**

“CEETHERM”

FULLY VARIABLE

ELECTRIC BLANKET CONTROL SWITCH

with the accent on SAFETY

- Neon Indication
- Fused
- Double Pole Off
- Ambient Temperature Compensation
- Simple cable grip that will take any size cable
- Suitable for any blanket loading

ACTUAL SIZE

SWITCHES

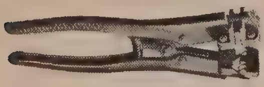
CRATER PRODUCTS LTD : KNAPHILL : SURREY *Tel.: BROOKWOOD 2571*

CUT STRIPPING COSTS

AND INCREASE PRODUCTION

E-Z WIRE STRIPPER

One squeeze of the handles grips, cuts and strips insulation.



BENCH TYPE CABLE STRIPPER

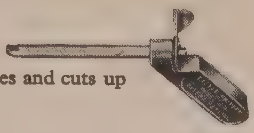
For cables up to ⅜″ o.d., including solid or inflexible types.

FOOT OPERATED WIRE STRIPPER

Ideal for small flexible cables up to ½″ o.d.

LITTLE SNIPPER WIRE CUTTER

Reaches into awkward places and cuts up to 16 s.w.g. copper wire.



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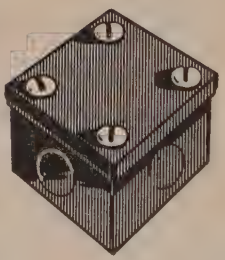
J. B. HYDE & CO. LTD.
DALE STREET, BROADHEATH, ALTRINCHAM, CHESHIRE
Telephone: Altrincham 0842 Telegrams: “BRAIDING”

REC 36 for further information

HOOPER ENGINEERING PRODUCTS LTD

SHEET METAL WORK · MACHINISTS



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SPECIAL & STANDARD
STEEL BOXES
for the
ELECTRICAL INDUSTRY

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CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

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SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, /o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF CHELTENHAM

Street Lighting, 1961-62

TENDERS are invited for the supply and erection of Group "B" Lighting Installations in various streets of the Borough as follows:—

Bill No. 1. For the supply only of 64 60-watt Sodium Lanterns and 42 45-watt Sodium Lanterns complete with all ancillary gear.

Bill No. 2. For the supply and erection of 106 Fluted Steel Columns together with the fitting and wiring of lighting equipment.

Specification and bills of quantities can be obtained from the undersigned on payment of a deposit of £3 3s., which will be refunded on receipt of a bona fide tender not subsequently withdrawn and the return of all documents.

Tenders, together with fully priced bills of quantities, are to be submitted in the envelope provided to the Town Clerk, P.O. Box No. 12, Municipal Offices, Cheltenham, not later than noon on Wednesday, 24th May, 1961.

The Council does not bind itself to accept the lowest or any tender.

W. E. C. BIRD, A.M.I.C.E.,
M.I.Mun.E., A.M.I.W.E.,
Borough Surveyor.

Municipal Offices,
Cheltenham.

800

BOROUGH OF BRIDPORT

Group "B" Street Lighting

THE Council are prepared to consider tenders for the supply and erection of fifty-one Stewarts and Lloyds Tubular Steel Columns and Brackets and 125-watt Mercury Vapour Discharge Lamps and ancillary works for Group "B" lighting at Barrack Street and St. Andrew's Road.

Form of tender, specification and bill of quantities may be obtained upon receipt of a deposit of £2 2s. (two guineas) from the Borough Engineer, Municipal Offices, South Street, Bridport, where drawings and conditions of contract may be inspected.

Tenders, including all documents, should be returned to the undersigned in a plain sealed envelope endorsed "Street Lighting, Barrack Street and St. Andrew's Road," not later than Thursday, 25th May, 1961.

The Council are not bound to accept the lowest or any tender.

F. C. M. FORWARD,
Town Clerk.

Municipal Offices,
Bridport.

785

THE INDIA SUPPLY MISSION, WASHINGTON, D.C.

invites tenders for the supply of Condenser Discharge Flashing Lamp Unit with timing unit, and without timing unit and 1.1-kV grade paper, required by the Superintending Engineer, Central Public Works Department, New Delhi, India.

Tender forms including specifications may be obtained from India Store Department, CDN Branch, Government Building, Bromyard Avenue, Acton, London, W.3, on payment of 14s. 4d., which amount is not refundable. Tender No. SE-374/A to be quoted in all applications.

Closing date for receipt of tenders in Washington is 15th May, 1961. 786

ELECTRICITY CORPORATION OF NIGERIA

Invitation to Tender: Meters

THE ELECTRICITY CORPORATION OF NIGERIA invites tenders for the supply C.I.F., Lagos/Apapa, of 21,000 Single-phase House Service Pattern Meters to be delivered regularly in 12 batches of 1,750 per month.

Tender forms including specifications may be obtained from the Liaison Officer, Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2, and must be submitted under confidential cover to reach the office of the Secretary to the Corporation in Lagos not later than noon, Friday, 9th June, 1961.

Tenders received in any other manner will not be considered. The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

G. W. E. NICOL,
Secretary to the Corporation.

819

COUNTY COUNCIL OF DURHAM

invite tenders for supplying Electric Lamps and miscellaneous appliances for year ending 31st August, 1962.

Forms of tender, returnable by 19th May, 1961, from undersigned.

G. H. METCALFE,
Director of Education.

Shire Hall,
Durham.
17th April, 1961.

771

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

Hendon Technical College,
The Burroughs, Hendon, London, N.W.4
Principal: E. Williams, B.Sc., Ph.D., F.R.I.C.

THIS college, situated in pleasing surroundings only a few miles from the centre of London, is one with well-developed advanced courses. "Sandwich" courses are a feature of the college work. Due to the rapid development of advanced work an increasing number of men and women of ability and initiative are required as members of the full-time staff and they are offered salaries as shown below.

Electrical Engineering Department

SENIOR LECTURER to teach Electronic Engineering up to the standard of the Part III, Institution of Electrical Engineers' examination.

Applicants should be graduates with good industrial experience. Teaching experience, whilst being very desirable, is not essential. Corporate membership of appropriate professional institutions is also very desirable.

Salary within the range £1,588-£1,801 per annum.

Anyone interested in the above post can obtain application forms and more information from the Clerk to the Governing Body, Town Hall, Hendon, London, N.W.4.

C. E. GURR, M.Sc., Ph.D.,
Chief Education Officer.

787

EAST MIDLANDS ELECTRICITY BOARD

Mansfield and North Nottinghamshire Sub-Area

SENIOR ASSISTANT (Stores) (Vacancy No. 44/61). Salary N.J.C. Grade 4, £890 × £30 to £1,010 per annum.

The successful applicant will be required to take charge of the Mansfield District Stores and to maintain contact with Storekeepers in other Districts within the Sub-Area. His responsibilities will include:—

1. The day-to-day operation of the Stores.
2. The discipline of Stores personnel.
3. In collaboration with the appropriate user departments, fixing stock levels and agreeing categorisation of materials.
4. The security and safe custody of stocks (including scrap materials).
5. Advising the Sub-Area Accountant on the standardisation of storekeeping methods and the centralisation of stocks.

Candidates should have a knowledge of the types of materials, plant and equipment, etc., used by the Board and be conversant with storekeeping and stock control practices.

Applications, giving details of age, qualifications, experience, present position and salary, should be forwarded to the Manager, Mansfield and North Nottinghamshire Sub-Area, Lime Tree Place, Mansfield, so as to reach him within fourteen days of the date of this advertisement.

773

THE STEEL COMPANY OF WALES LIMITED (TINPLATE DIVISION)

APPLICATIONS are invited for the following posts at the TROSTRE WORKS, LLANELLY—a modern cold reduction tinplate plant:—

ASSISTANT ELECTRICAL ENGINEER.
Qualifications to H.N.C. or near equivalent. A good background of electrical training and experience is required, with particular reference to modern electrical control systems and D.C. variable speed drives.

ASSISTANT ELECTRONIC FOREMAN.
This post requires a man with education to O.N.C. or equivalent level, and with experience of industrial electronics. The ability to handle a team of men on maintenance work in a continuously operating plant is essential.

Good working conditions including canteen facilities. A contributory pension scheme is available.

Applications, giving full details of education, experience and salary required, should be addressed to:—

The Supt. Labour and Wages
The STEEL COMPANY OF WALES Ltd.
(Tinplate Division)
Carmarthen Road, Swansea, Glam.

to be received within 10 days of the date of this advertisement.

745

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

Regional Electrical Engineer's Department

APPLICATIONS are invited for appointments in the Transmission Project Branch of the Regional Electrical Department, based on Leeds.

(1) THIRD ASSISTANT ENGINEERS
(Civil, Specifications and Contracts).
Salary Grade 7BX (£1,200-£1,500 p.a.).

Applicants should have had previous experience in contract procedure for major civil engineering and building works. Duties will include the preparation of estimates of costs, preparation of contract documents with a special reference to specifications and bills of quantities, examination and perusal of tenders. Should also be able to conduct contract measurement on site.

Candidates will work in a team responsible for the engineering of civil and building works for major transmission substations in the Region, and experience on constructional and electrical projects would be an advantage.

(2) THIRD ASSISTANT ENGINEERS
(Civil, Site).
Salary Grade 8BX (£1,105-£1,410 p.a.).

Applicants should have had experience in the supervision of the construction of major civil engineering works comprising reinforced concrete structures and buildings employing modern methods of quality control. Experience on power station or substation civil engineering projects is desirable.

(3) THIRD ASSISTANT ENGINEER
(Drawing Office Section Leader, Electrical).
Salary Grade 8BX (£1,105-£1,410 p.a.).

To be responsible to the Engineer in Charge, Drawing Office, for the organisation and supervision of the Electrical Engineering Section. Applicants should have had experience in all aspects of drawing office work connected with electrical contracts at main transmission substations comprising schematic, wiring and phasing diagrams, electrical layout, section and auxiliary plant building layout drawings.

(4) THIRD ASSISTANT ENGINEER
(Drawing Office Section Leader,
Civil and Mechanical).
Salary Grade 8BX (£1,105-£1,410 p.a.).

To be responsible to the Engineer in Charge, Drawing Office, for the organisation and supervision of the Civil and Mechanical Engineering Section. Applicants should have experience in all aspects connected with major civil engineering contracts at main transmission substations comprising reinforced concrete structures and associated buildings. A knowledge of reinforced concrete and structural design would be an advantage.

(5) FOURTH ASSISTANT ENGINEERS
(Clerk of Works, Civil).
Salary Grade 11BX (£855-£1,165 p.a.).

Applicants should have had experience in the supervision of the construction of major civil engineering works comprising reinforced concrete structures and buildings employing modern methods of quality control. Experience on power station or substation civil engineering works would be an advantage. Knowledge in the use of surveying instruments for setting out checking of foundation levels and alignment of structures is essential.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 19th May, 1961.
815

CONSULTING ENGINEERS REQUIRE INTERMEDIATE AND JUNIOR ELECTRICAL ENGINEER ASSISTANTS

to be capable of designing under limited supervision all types of internal and external electrical installations in connection with hospital, education and industrial building programmes. These situations are for permanent staff and carry attractive salary coupled with pleasant working conditions, superannuation and life assurance scheme.

Please apply :—

E. G. PHILLIPS SON & PARTNERS
26, Annesley Grove, Nottingham
606

ARABIAN GULF SHEIKDOM OF QATAR

STATE ELECTRICITY DEPARTMENT, DOHA

APPLICATIONS are invited for the following posts on 3-5-year contracts in a new steam power station, the initial equipment of which is 2 15,000-kW turbo-alternator sets with associated gas-fired boilers and ancillary equipments.

ASSISTANT POWER STATION SUPERINTENDENT (Scale E.1)

Qualifications: First Class M.O.T. Certificate (Steam and Motor) or Higher National Certificate (Mechanical and Electrical) plus at least six years' experience in modern power station operation and maintenance practice.

ELECTRICAL MAINTENANCE ENGINEER (Scale E.2)

Qualifications: Higher National Certificate (Electrical) plus at least six years' experience in power station plant maintenance, particularly rotating machinery, transformers, control and switchgear up to 66 kV and protecting gear.

MECHANICAL MAINTENANCE ENGINEER (Scale E.2)

Qualifications: First Class M.O.T. Steam Certificate or equivalent, with at least 3 years' maintenance experience with modern steam power station plant and ancillary equipment. Applicants must be prepared to carry out overhauls assisted by locally employed fitters and also to assist with maintenance of large diesel units.

SHIFT CHARGE ENGINEERS (Scale E.2)

Qualifications: Second Class M.O.T. Certificate or National Certificate or equivalent, with at least four years' experience in charge on shift duties in modern steam power stations and fully experienced in synchronising and switching operations on H.T. up to 66-kV and L.T. feeder networks.

Salaries: Scale E.1, £2,250 - £2,280; Scale E.2, £1,590-£2,070. Starting point according to experience.

Age Limits: 30-45 years.

General Conditions: FREE air-conditioned accommodation furnished at high standard. FREE fuel, water and electricity. FREE air passages for applicant, wife and up to three children. FREE medical and dental attention. ANNUAL LEAVE of six days for each month of duty. INTEREST - FREE car loan with generous running allowance. GRATUITY of one month's salary for each year of service. NO INCOME TAX.

Applications endorsed "Electricity Qatar" should be sent by AIRMAIL to Director of Personnel, Government of Qatar, Doha, Qatar, Arabian Gulf, with copy to Messrs. Preece, Cardew & Rider, Consulting Engineers, 8-12, Queen Anne's Gate, London, S.W.1, giving full details of qualifications, experience, nationality, age, religion, marital status, names of three referees and a recent dated photograph.
780

ELECTRICAL ENGINEER

JUNIOR DESIGNER required for D.C. and A.C. electrical machines. H.N.C. or equivalent. Aged 23 to 27 years. Salary according to experience.

Full details of qualifications and experience should be sent to the General Manager, Newton Brothers (Derby) Ltd., Alfreton Road, Derby.
748

BARNET GROUP HOSPITAL MANAGEMENT COMMITTEE

Group Superintendent Engineer

APPLICATIONS are invited for the post of GROUP SUPERINTENDENT ENGINEER (40½ to 50 points). Salary scale £1,155 × £35 (3) × £40 (2) to £1,340 per annum, plus London weighting £50 per annum. The officer appointed will be responsible to the Management Committee for the satisfactory operation, maintenance and co-ordination of the engineering services and activities (including both mechanical and electrical) of all the hospitals, clinics and offices in the Group, and will be directly in charge of the engineering services of the main general hospital in the Group (Barnet General Hospital, 490 beds) and its smaller ancillary hospitals.

In addition to normal apprenticeship and a thorough practical mechanical engineering training, candidates should have passed an examination in engineering technology and hold one of the following qualifications (or equivalent qualification approved by the Minister or Secretary of State for Scotland):—

(a) Extra First Class Certificate of Competency in Marine Engineering, or equivalent Naval Certificate.
(b) Higher National Diploma in Mechanical Engineering.
(c) Higher National Certificate in Mechanical Engineering.
(d) Diploma in Mechanical Engineering of a Technical College recognised for the award of the Higher National Certificate.

A house, situated adjacent to the main hospital is available for occupation and would be rented from the Management Committee.

Applications, giving full details of training, experience, with the names of three referees, should be sent to the Group Secretary, Barnet Group Hospital Management Committee, 1, Wellhouse Lane, Barnet, Herts., not later than 23rd May.
743

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Second Assistant District Engineer, Coatbridge District

APPLICATIONS are invited for the above appointment. Applicants should have had sound engineering and technical training, with qualifications leading to Corporate Membership of the Institution of Electrical Engineers. They should have had experience with the maintenance and operation of H.V. and L.V. overhead and underground networks, and substations on a large distribution system. They should also be conversant with load flow diagrams, voltage drop and short circuit calculations, and should have had experience with H.V. fault location.

The salary and conditions of service will be in accordance with the National Joint Board Agreement and the post will be superannuable. It is a condition of this appointment that the successful candidate take standby duty in accordance with the above agreement, and reside within a reasonable distance of the District Offices at Coatbridge.

The present classification and grading is J.7 (Scale 11), present salary £1,275-£1,410.

Application forms, which may be obtained from the Area Manager, Montrose Crescent, Hamilton, should be returned not later than Friday, 5th May, 1961.
783

WAR DEPARTMENT

requires ASSISTANT ELECTRICAL ENGINEERING OFFICERS in R.E.M.E. Telecommunications Branch at Christchurch, Hants, and Command Workshop at Kinnegar, N. Ireland. Duties: preparation of technical handbooks on communications basic techniques and equipment; supervision of group dealing with maintenance and repair of telecommunications equipment. Quals.: recognised engineering apprenticeship with subsequent experience on any of above duties, with emphasis on repair and maintenance of telecommunications equipment. Corporate Membership of I.E.E. or equivalent.

Salary £936 (age 25) to £1,430. Opportunities for establishment.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D207/1A. Closing date 12th May, 1961.
790

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Operation and Maintenance Staff

The engineering organisation of the Rutherford High Energy Laboratory is being expanded and technical staff are required to work in a group concerned with the operation and maintenance of a large Proton Synchrotron which will be used in the Laboratory's research programme.

Applicants with a sound basic engineering training and possessing good experience in the control and/or maintenance of large power plant are required to undertake these duties as applied to a 120 MVA power plant comprising a large motor alternator set feeding transformers and an associated converter installation. For the maintenance posts, experience of large machine erection and alignment is required.

These posts may involve unusual hours of work and/or shift working.

Possession of an appropriate National Certificate in Engineering together with a general knowledge of converter or rectifier installations, control and protection systems and industrial electronics would be an advantage. Several posts are available, the salary being in the range £1060 to £1490 according to age and experience.

The Rutherford High Energy Laboratory is a centre for research into fundamental nuclear science and is being constructed adjacent to the Atomic Energy Establishment at Harwell. There is a contributory superannuation scheme and assistance is given with housing.

If you are interested in joining this new organisation, then please send a POST CARD for an application form to:

The Personnel Officer
The Rutherford High Energy Laboratory
Harwell, Berkshire
quoting reference VN 46/48

763

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Birmingham Area

GENERAL ASSISTANT ENGINEERS
(Technical and Planning Section)
(Area Offices).

The successful applicant will be required to assist with the analysis of loading conditions, design of extensions and reinforcements to the H.V. and M.V. systems, both underground and overhead, and layout and specifications of plant and equipment. Salary within the ranges £890/£1,015, £965/£1,090 or £1,040/£1,165 per annum (N.J.B. Grades N.16, 15 or 14), according to qualifications and experience.

Apply by letter within 7 days, stating age, experience, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Area

FIRST ASSISTANT DISTRICT ENGINEER (Gloucester).

Applicants should be good organisers and have had experience in all branches of distribution work, including operation, maintenance and construction of H.V. and L.V. cables, overhead lines, substations, etc. Technical qualifications desirable. Salary £1,190/£1,325 per annum (N.J.B. Grade F.5).

Apply by letter within 14 days, stating age, present salary, full particulars of experience and present position, to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

F. W. CATER,
Secretary. 807

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

Second and Third Assistant Engineers (Civil)

APPLICATIONS are invited for the appointments of SECOND AND THIRD ASSISTANT ENGINEERS (Civil) in the Midlands Project Group.

Applicants should have had general experience in the design and construction of power stations or other industrial buildings and ancillary work, and particular experience in design of either steel or reinforced concrete frames. Some experience in billing, measuring and estimating is also desirable. They should preferably hold an appropriate qualification.

The salary will be within Grade 5, Scale 15, £1,400-£1,830 per annum for the Second Assistant Engineer, and Grade 7, Scale 13, £1,285-£1,610 per annum for the Third Assistant Engineer.

Applications should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 15th May, 1961.

Envelopes should be marked "Confidential, Staff Vacancy No. MPG.28/61." 803

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified engineers for the following appointments which are subject to the conditions of the National Joint Board:—

Wear Sub-Area

SECOND ASSISTANT ENGINEER,
Sub-Area Commercial Officer's Staff,
Industrial Section,
Sub-Area Headquarters, Sunderland.

Applicants should have a sound knowledge of the general uses of electric power and heat in industry and a wide experience of negotiations with all types of industrial consumers.

Salary Schedule A, Class L, Grade 7, £1,440/£1,610 per annum.

York Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER, Scarborough District.

Applicants should have experience of high and low voltage, urban and rural, overhead and underground distribution systems.

Salary Schedule A, Class E, Grade 7, £965/£1,090 per annum.

THIRD ASSISTANT ENGINEER,
Sub-Area Engineer's Staff,
Construction Section,
Sub-Area Headquarters, York.

Applicants will be required to assist in all aspects of the construction of h.v. and l.v., overhead and underground distribution networks and substations up to and including 66 kV.

Salary Schedule A, Class H, Grade 10, £965/£1,090 per annum.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement. 829

EAST MIDLANDS ELECTRICITY BOARD

Northamptonshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER,
Northampton District
(Re-advertised Vacancy No. 34/61).

Salary N.J.B. Class G, Grade 9, £965 to £1,090 per annum.

The duties of the post will be to assist in the planning, construction, operation and maintenance of underground and overhead systems up to and including 11 kV.

The successful candidate will be required to reside in or near Northampton and to undertake standby duty.

PRINCIPAL ASSISTANT (Income),
Northamptonshire Sub-Area Headquarters
(Vacancy No. 46/61).

Salary N.J.C. Grade 7, £1,250 × £35 to £1,355 per annum.

The successful applicant will be responsible for the three Sections dealing with:—

1. Pre-Billing and Prepayment.
2. Special Billing.
3. Post-Billing.

Candidates should possess a recognised accountancy qualification and have had experience in all matters relating to consumers' accounts.

Applications for the above vacancies, giving details of age, qualifications, experience, present position and salary, should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, so as to reach him not later than Saturday, the 13th May, 1961.

822

LONDON COUNTY COUNCIL

SOUTH EAST LONDON TECHNICAL COLLEGE

Lewisham Way, London, S.E.4

DEPARTMENT OF ELECTRICAL ENGINEERING

Applications are invited for LECTURERS and ASSISTANT LECTURERS (Grade B) in AUTOMATIC TELEPHONY, RADIO COMMUNICATION and LIGHT CURRENT ELECTRICAL ENGINEERING, including Instrumentation.

Candidates should be well qualified, have industrial experience and preferably some teaching experience.

The Department offers Full-time, Sandwich, Part-time Day and Evening Courses. Successful candidates may be required to teach up to Part III I.E.E. and/or C. & G. Telecommunications supplementary studies standard.

Salary Scales: (i) Lecturers £1,408 to £1,601 with possible entry above minimum.
(ii) Assistant Lecturers (Grade B) £738 to £1,486.

Point of entry and maximum dependent on relevant industrial or teaching experience and qualifications.

Application forms from the Secretary, returnable within two weeks, quoting (FE.3a/R/950/4). 760

Situations Vacant (continued)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

SUB-AREA COMMERCIAL DEPT.
(82/61.R)

THIRD ASSISTANT ENGINEER
(Commercial).

Candidates should have had a good general and technical education with experience in the design, installation and selling of thermal storage heating to builders, architects, etc., together with a knowledge of tariffs. Membership of the Institution of Electrical Engineers or possession of the Higher National Certificate would be an advantage.

Salary N.J.B. Class L, Grade 9 (£1,275-£1,410 per annum).

Apply by letter to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, by 12th May, 1961.

Essex Sub-Area

NORTH ESSEX DISTRICT
(92/61.R)

ENGINEER.

This vacancy arises from the impending retirement of the present District Engineer.

Candidates should have had wide experience in the planning, construction, operation and maintenance of overhead and underground distribution systems (including substations) and should be capable of organising and supervising the engineering work of the District.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary N.J.B. Class F, Grade 3 (£1,350-£1,500).

Apply by letter to J. C. Horrell, M.I.E.E., Manager, North Essex District, Eastern Electricity Board, Cressing Road, Braintree, Essex, by 12th May, 1961.

Northmet Sub-Area

ASSISTANT ENGINEERS.

(a) Third Assistant Engineer, Stevenage District (Ref. 1030) (84/61.R).
(b) Fourth Assistant Engineer, Hendon District (Ref. 1054) (87/61N.).
(c) Fourth Assistant Engineer, Hertford District (Ref. 942) (88/61.N).
(d) Fourth Assistant Engineer, Stevenage Dist. (Ref. 1055) (89/61.N).

Candidates should have had sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary :—
(a) N.J.B. Class G, Grade 9 (£965-£1,090).
(b) N.J.B. Class G, Grade 11 (£825-£940), plus London allowance.
(c) (d) N.J.B. Class G, Grade 11 (£825-£940).

Apply by letter, by 8th May, 1961, as follows :—

For (a) and (d) to H. L. Sumner, Manager, Eastern Electricity Board, Walkern Road, Stevenage.
For (b) to F. A. Moinet, M.I.E.E., Manager, Eastern Electricity Board, 137/139, Brent Street, Hendon, London, N.W.4.
For (c) to W. H. Hatton-Ward, Assoc.I.E.E., A.M.B.I.M., Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts.

METER TESTING STATION,
15, FRIERN BARNET LANE, LONDON, N.11
(90/61.N)

GENERAL ASSISTANT ENGINEER
(Ref. 979).

Candidates should have had a good general and technical education. A knowledge of the repair, testing and commissioning of meters and metering equipment for domestic and industrial supplies will be an advantage.

Salary N.J.B. Class N, Grade 15 (£965-£1,090) plus London allowance.

Apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 8th May, 1961.

EDMONTON DISTRICT
(93/61.N)

SENIOR SALES REPRESENTATIVE
(Ref. 1057).

Candidates should have had practical training with experience of domestic and small commercial and industrial installations. An ability to sell appliances with advice to consumers on supply matters, tariffs and apparatus is required.

Salary N.J.C. Grade 2 (£700-£775) plus London allowance.

Apply by letter to C. A. Baker, B.Sc.Eng. (Lond.), M.I.E.E., Manager, Eastern Electricity Board, Edmonton District, 305, Fore Street, Edmonton, London, N.9, by 8th May, 1961.

Suffolk Sub-Area

STOWMARKET DISTRICT
(83/61.N)

THIRD ASSISTANT ENGINEER

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations, at voltages up to and including 33 kV.

Salary N.J.B. Class F, Grade 9 (£890-£1,015).

Apply by letter to G. N. H. Mayes, T.D., A.M.I.E.E., Manager, Stowmarket District, Eastern Electricity Board, 25, Ipswich Road, Stowmarket, Suffolk, by 12th May, 1961. 818

ELECTRICAL DESIGN-DRAUGHTSMAN

FULLY qualified Electrical Design-Draughtsman required for the planning and the general technical co-ordination of the electrical design in connection with standard and special type of Resistance, Vacuum and Induction Furnaces.

This work will include the preparation of data so that control circuit diagrams, purchasing requisitions, control panels, layouts, etc., can be prepared for their installation.

Applications, which will be treated in the strictest confidence, should give full details of experience and qualifications, and should be addressed to the Secretary, Wild-Barfield Electric Furnaces Ltd., Elecfurn Works, Otterspool Way, Watford, Herts. 689

JOSEPH LUCAS LIMITED

ELECTRICAL ENGINEER

We have a most interesting vacancy in the Advanced Planning Department of our Engineering and Design Group for a Senior Electrical Engineer having experience in the design or development of rotating electrical machines.

The work includes investigations to determine specifications for the future requirements for automotive rotating machines, advanced designs to meet these specifications and the use of digital computers in electrical machine design.

Candidates should have an honours degree in electrical engineering or A.M.I.E.E.

The position carries a good salary which is reviewed annually, and a contributory pension scheme is in operation.

Apply in writing, giving full details of age, qualifications and experience, to the :

Personnel Manager
JOSEPH LUCAS LIMITED
Great King Street, Birmingham, 19
quoting reference PM/D/522

781

DRAUGHTSMEN

with experience in

SWITCHGEAR DESIGN, CIRCUIT DESIGN or ELECTRONIC APPLICATION also PANEL WIRING

wanted by

J. & E. HALL LTD., DARTFORD

Knowledge of automatic controls for lifts or refrigerating plant desirable, but not essential.

Apply quoting Ref: C.R.W.

764

ROYAL MILITARY COLLEGE OF SCIENCE, SHRIVENHAM, BERKSHIRE

GRADUATE DEMONSTRATORS (Male) required in Department of Electrical and Instrument Technology. Teaching at university level. To assist in supervision of students' laboratory work and in research by staff and students. Extensive well-equipped laboratories. Opportunities to engage in personal research towards higher degree in fields of electrical engineering, electronics, computing and servo-mechanisms. Quals. 1st or 2nd class Honours Degree or equiv. in Electrical Engineering or Physics.

Salary range £754 to £910; superannuation under F.S.S.U. Appointments normally 3 years but may be extended. Opportunities exist for promotion to grades of Lecturer and higher grades. Quarters available for single men; possibility of houses for married men.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting **D.200/1A.** Closing date 13th May, 1961. 789

THE UNIVERSITY OF LEEDS

Department of Electrical Engineering

APPLICATIONS are invited for appointment to Lectureships in the Department of Electrical Engineering. The requirements fall into two categories :—

(1) Honours Degree in Physics together with experience in the electrical engineering industry.
(2) Honours Degree in Electrical Engineering together with industrial or other experience in one of the following fields: electric power engineering, electrical machines or electrical measurements.

Salary on the scale £1,050 × £50 to £1,400 × £75 to £1,850 (efficiency bar at £1,550), according to age, qualifications and experience.

Applications (three copies), together with the names of three referees, should reach the Registrar, The University, Leeds, 2 (from whom further particulars may be obtained) not later than 22nd May, 1961. 805

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuableN.J.B. appointments :—

ASSISTANT SHIFT CHARGE ENGINEER,
ROGERSTONE POWER STATION,
RISCA ROAD, ROGERSTONE, MON.
(Vacancy No. 81/ER/61).

Salary Schedule A, Class G, Grade 8, Scale 8, £1,040-£1,165 per annum.

RE-ADVERTISEMENT:
ASSISTANT SHIFT CHARGE ENGINEER,
USKMOUTH "A" POWER STATION,
WEST NASH, Nr. NEWPORT, MON.
(Vacancy No. 82/ER/61).

Salary Schedule A, Class K, Grade 8, Scale 11, £1,275-£1,410 per annum.

Previous applicants need not re-apply.

STATION SHIFT CONTROL ENGINEER,
USKMOUTH "A" & "B"
POWER STATIONS,
WEST NASH, Nr. NEWPORT, MON.
(Vacancy No. 83/ER/61).

Salary Schedule A, Class M, Grade 10, Scale 1, £1,275-£1,410 per annum.

For the above posts applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

10% shift allowance applied in all cases.

FOURTH ASSISTANT ENGINEER (Civil),
DIVISIONAL TRANSMISSION DEPT.
BASED AT NEATH, GLAM.
(Vacancy No. 84/ER/61).

Salary Schedule B, Class AX, Grade 9, Scale 9, £1,005-£1,245 per annum.

Duties will include site survey and levelling for grid substations. The supervision of site construction work including concrete foundations (and piling where necessary), reinforced concrete structures and buildings, site measurements and certification for payment.

FOURTH ASSISTANT ENGINEER
(Overhead Transmission Lines),
DIVISIONAL TRANSMISSION DEPT.
BASED AT NEATH, GLAM.
(Vacancy No. 85/ER/61).

Salary Schedule B, Class AX, Grade 9, Scale 9, £1,005-£1,245 per annum.

Duties include survey work associated with the construction of 132-kV and higher voltage transmission lines, supervision of construction of steel tower and wood pole overhead lines.

Applicants for the above posts should possess H.N.C. or equivalent qualifications and experience in this type of work is desirable.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-edwen Road, Gabalfa, Cardiff, to be returned by 13th May, 1961. 835

SOUTHERN ELECTRICITY BOARD

Third Assistant Engineer (Planning and Development)

Sub-Area Engineering Department of No. 1 Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Class M, Grade 10 £1,325-£1,460 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist in the planning of H.V. and L.V. networks, including system load flow and short-circuit calculations.

Applications on forms obtainable from the ub-Area Secretary, 2/6, Windmill Lane, outhall, Middlesex, and returned to him, uoting Z.1339, not later than 8th May, 1961.

Field Engineer (Construction)

Sub-Area Engineering Department of No. 3 Portsmouth) Sub-Area. Salary N.J.B. Class L, Grade 13 (£965-£1,090 per annum). N.J.B. onditions of service.

The duties of the post will be to carry out site upervision, installation and erection of plant, quipment and overhead lines, the laying of ables and other constructional work on all istribution systems up to and including 33 kV.

Applications on forms obtainable from the ub-Area Secretary, Lower Drayton Lane, osham, Portsmouth, and returned to him, uoting Z.1312, not later than 8th May, 1961.

The successful applicants for the above ppointments will be required to contribute to e Electricity Supply (Staff) Superannuation cheme, if eligible. 820

BRUSH

(A member of the Hawker Siddeley Group — Industrial Division)

DRAUGHTSMEN

TRANSFORMERS
SWITCHGEAR
ROTATING ELECTRICAL MACHINES
MOTOR CONTROL GEAR
ELECTRIC AND DIESEL ELECTRIC LOCOMOTIVES
(Mechanical, Control Gear and Electrical Machines)
GENERAL ENGINEERING

If you are a qualified Draughtsman and interested in one of the above vacancies, please apply to
Mr. A. Garner
Brush Electrical Engineering Company Limited
Loughborough, Leicestershire
quoting reference: PL.9935 and giving brief details of your qualifications and experience.

ALL APPLICATIONS WILL BE TREATED IN THE STRICTEST CONFIDENCE.

The Company is situated some 15 miles from Leicester, Nottingham and Derby on the outskirts of a small town amid the pleasant Leicestershire countryside and away from the smoky industrial environment. Schooling facilities are good for all grades of education, including advanced studies at Technical Colleges and Universities in the district. In appropriate cases assistance with housing and removal expenses can be considered.

710

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's Central District at Falcon House, Aldersgate Street, London, E.C.1.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 11, £1,015 per annum rising to £1,140 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address within fourteen days of the publication date of this notice. Please quote ref. PER/V/3238/R. 804

LONDON ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at 44, Powis Street, Woolwich, London, S.E.18.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

The post is graded under Schedule B of the National Joint Board Agreement as Class BX, Grade 15, £695 per annum rising to £920 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent direct to the Manager, South Eastern District, at the above address within fourteen days of the publication date of this notice. Please quote ref. PER/V/3219/R. 830

J. & P.

SWITCHGEAR DEPT.

SENIOR TECHNICAL SALES ENGINEER

JOHNSON & PHILLIPS LTD. have an immediate vacancy in their Switchgear Department for a SENIOR TECHNICAL SALES ENGINEER, who would be based on their Works.

Duties involve preparation of Tenders and handling of Contracts for Switchgear up to 33 kV.

This is an interesting post with considerable scope and good prospects.

Applications stating age, training and experience to :—

Employment Manager
JOHNSON & PHILLIPS LIMITED
Victoria Way, Charlton, London, S.E.7

Local initial interviews arranged if desired.

801

Situations Vacant (continued)

YORKSHIRE ELECTRICITY BOARD

Head Office

CHIEF ENGINEER'S DEPARTMENT
DISTRIBUTION DESIGNS (Substations)
SECOND ASSISTANT ENGINEER.

Duties will include the design of indoor and outdoor substations operating at voltages of 33 kV and above, the preparation of specifications for substation plant and subsequent negotiations with plant manufacturers. They will also cover protective gear applications on the primary h.v. system.

Applications are invited from suitably qualified engineers having a sound general knowledge of substation plant and some experience of field construction.

Salary N.J.B. Class BX, Grade 5 (transitional to Scale 14), £1,375/£1,720 per annum.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Nr. Leeds, not later than 12th May, 1961.

No. 1 (Bradford) Sub-Area

KEIGHLEY DISTRICT
DISTRICT COMMERCIAL ENGINEER.

Applicants should have had considerable experience in all aspects of a District Commercial Organisation. Candidates must have a sound knowledge of tariffs and their appropriate application, and be capable of carrying out negotiations with all classes of consumers for new and additional loads. They should have experience of load development, be fully conversant with I.E.E. Wiring Rules and with Statutory Regulations, and be capable of controlling staff. The possession of a Higher National Certificate in Electrical Engineering or its equivalent would be an advantage.

Salary N.J.B. Class F, Grade 3 (Scale 12), £1,350/£30/£1,500 p.a.

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have passed the Associate Membership Examination of the Institution of Electrical Engineers, or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cables and overhead lines and substations, and medium low voltage networks.

Candidates should be prepared to reside within the District and undertake standby duties.

This post has been advertised before and previous applicants need only state by letter if they wish their application to be re-considered.

Salary N.J.B. Class F, Grade 9 (Scale 6), £890/£1,015 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, 1, not later than 12th May, 1961.

No. 4 (Leeds) Sub-Area

CONSUMERS' ENGINEER (Leeds).

Applicants should have had a sound practical training in the electricity supply industry and should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification. Candidates should be capable of carrying out negotiations with all types of consumers for new and additional supplies and have a sound knowledge of the various tariffs. They should have had experience of general load development, be fully conversant with the Electricity Supply and I.E.E. Regulations and be capable of controlling staff.

Salary N.J.B. Class K, Grade 7 (Scale 12), £1,350/£1,500 p.a.

ASSISTANT CONSUMERS' ENGINEER (Leeds).

Applicants should have had a sound practical training in the electricity supply industry and should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification. They should have had experience in general load development in the industrial, commercial and domestic fields, be fully conversant with Electricity Supply and I.E.E. Regulations and be capable of undertaking all forms of consumer service.

Salary N.J.B. Class K, Grade 10 (Scale 9), £1,115/£1,245 p.a.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Nr. Leeds, not later than 12th May, 1961. 826

ENGLISH ELECTRIC

CONTROL ENGINEERS

The continued expansion of large sectors of the British industry depends on the right electrical control equipment being available. There is an ever-increasing demand for this equipment and the Company requires control engineers to undertake the design of control schemes for heavy industrial processes. Particularly, for drive systems in the steel industry.

The work involves the design of detailed control schemes for a wide variety of processes and is mainly associated with closed loop control systems using magnetic and transistor amplifiers. Development work covers the design of static switching schemes — using magnetic and transistor elements — for complex automatic control systems. Successful applicants will be joining a leading team of engineers in this field and the work will appeal particularly to young engineers between the ages of 25 and 30, who enjoy meeting people and selling technical ideas, while at the same time doing a job requiring high technical ability. Many projects involve travelling to various parts of the United Kingdom and overseas.

Minimum qualifications required are Graduate Membership of I.E.E. or I.Mech.E.

Write giving full details of age, qualifications and experience to Dept. G.P.S., English Electric House, Strand, London, W.C.2, quoting reference ER 1296P.

761

ENGINEERING DESIGNER DRAUGHTSMEN

required by Air Ministry in London.

Salary (inner London scale) Grade III, £658-£1,048 (£866 at age 25), starting salary depends on age, quals. and exp.

ELECTRICAL ENGINEERING DESIGNER DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution (Grade III).

Candidates should have served a recognised apprenticeship or have had equivalent training and also adequate practical experience. Possession of recognised technical qualifications an advantage, financial assistance and time off may be allowed for recognised courses of study for technical qualifications. 5-day week with 18 days paid leave p.a. initially. Promotion and pension prospects. Some overseas tours with special allowances in addition to salary.

Applicants who must be natural born British subjects, should write (quoting Kings Cross O/N 803) to AIR MINISTRY, W.G.d, LACON HOUSE, THEOBALDS RD., LONDON, W.C.1, or to ANY EMPLOYMENT EXCHANGE, giving age, details of training, qualifications and full particulars of former posts held. Candidates selected will normaly be interviewed in London and certain expenses reimbursed. Only candidates selected for interview will be notified. 252

EASTERN ELECTRICITY BOARD

Essex Sub-Area

Two Fourth Assistant Engineers (Control)

Sub-Area Headquarters

(Ref. 91/61/N/R)

CANDIDATES should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. A knowledge of system protection is desirable.

Salary N.J.B. Class L, Grade 13, £965-£1,090 plus a shift allowance of 10% plus London allowance.

(Subject to formal confirmation the Sub-Area will be re-classified from 1st April, 1961, in which case the salary for this appointment will be N.J.B. Class M, Grade 13 (£1,040-£1,165 plus shift allowance of 10% plus London allowance).

Apply by letter to C. C. Brazier, A.M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, Nr. Brentwood, Essex, by 12th May, 1961. 837

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

Deputy Power Station Superintendent, Darlington Power Station

APPLICATIONS are invited for the appointment of DEPUTY SUPERINTENDENT at Darlington Power Station.

Applicants should have had a wide experience in the operation and maintenance of generating plant and have also held positions of responsibility involving the control of technical engineering and administrative staff.

The successful applicant will be expected to reside within reasonable distance of the power station.

It is desirable that applicants should possess qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule A, Grade 3, Class F (£1,350-£1,500 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 12th May, 1961.

793

G. W. B.
FURNACE DIVISION

has the following vacancies:

1. ELECTRICAL ENGINEER to deal with design and handling of electrical plant for furnace equipment. Applicants should have H.N.C. Electrical Engineering or be studying for the equivalent qualification. Engineering apprenticeship and some application experience in dealing with electrical plant essential; experience with furnace equipment desirable but not essential. Age group 21-28 preferred.

2. ELECTRICAL DRAUGHTSMAN to handle diagrams, preparation of electrical control gear and layout of plant. Good background in drawing office experience essential.

Apply, in confidence, giving details of experience, to :—

Divisional Manager
G.W.B. FURNACES LIMITED
(Furnace Division)
Dibdale Works, Dudley, Worcs.

795

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT (Secretarial),
Surrey Area Headquarters, Dorking.

Salary £780-£880 p.a. under N.J.C. Grade 3, or £890-£1,010 p.a. under N.J.C. Grade 4, according to experience and qualifications. Superannuable. The appointment will afford an opportunity of gaining good all-round experience of the Board's organisation. Duties will include assisting in system reviews and similar assignments.

Applications, quoting ER, and naming two referees, on forms from Surrey Secretary, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, by 10th May, 1961.

GENERAL ASSISTANT ENGINEER,
Sevenoaks and Reigate District.

Salary £890-£1,015 per annum under N.J.B. Agreement, Class G, Grade 10, according to qualifications, experience and ability. Superannuable. Applicants should be suitably qualified and have training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The successful candidate will operate from District office, Oxted, but duties will cover any point within the District.

Applications, quoting ER, and naming two referees, to District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 10th May, 1961.

JUNIOR ASSISTANT DISTRICT
COMMERCIAL ENGINEER,
Tunbridge Wells District.

The duties of this post will be of a general nature, and preference will be given to applicants who are studying for or have completed the H.N.C. course. Salary N.J.B. Class F, Grade 12, £715-£805 p.a.

Applications, quoting ER, and naming two referees, to District Manager, SEEBOARD, Town Hall, Tunbridge Wells, by 10th May, 1961.

ASSISTANT DISTRICT ENGINEER,
Maidstone District.

Salary under N.J.B. Class F, Grade 9, £890 × £25 to £1,015. Superannuable. Applicants should have had a good general education, be technically trained to H.N.C. standard and have had practical experience in general distribution work on H.V. and L.V. systems. Knowledge of the preparation of system extension and reinforcement proposals an advantage.

Applications, quoting ER, and naming two referees, to District Manager, SEEBOARD, Fairmeadow, Maidstone, by 10th May, 1961. Previous applicants for this appointment need not re-apply.

GEORGE WRAY,
Secretary. 827

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

(Re-Advertisement)
Third Assistant Engineer (Site Progress)

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER (Site Progress) at Aberthaw Power Station.

Candidates should preferably possess a Higher National Certificate in either mechanical or electrical engineering and have served a recognised engineering apprenticeship. Experience on the construction of heavy plant as installed in modern power stations either in a manufacturer's works or on site is essential, and a knowledge of the civil engineering work involved would be an advantage.

The selected candidate will be required to maintain up-to-date charts on the progress of the works on site in accordance with previously agreed programmes, and to assist the Resident Engineer in anticipating any divergence from these programmes. Ability to co-ordinate with Regional P.I.T. Officers will be required.

The salary will be within Grade 7, Scale 13 (£1,285-£1,610 per annum) of the National Joint Board Agreement.

Applications should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham, 30, and should be returned to him not later than 15th May, 1961.

Envelopes should be marked "Confidential, Staff Vacancy No. MPG.29/61." 823

EMPRESA NACIONAL DE TELECOMMUNICACIONES
REPUBLIC OF COLOMBIA
SOUTH AMERICA

A TELECOMMUNICATIONS ENGINEER

is required to assist the Chief English Resident Engineer in the development of the long-distance telephone and telegraph services of Colombia, under the technical direction of Messrs. Preece, Cardew & Rider, Consulting Engineers. The work comprises the supervision and administration of contracts for multi-channel V.H.F. radio links, automatic and manual telephone exchanges, subscribers' telex and public telegraph automatic switching systems, etc., and includes the planning and supervision of installation works, acceptance testing of the completed installations and organisation of the subsequent maintenance arrangements. In addition to a general knowledge of telecommunications, applicants should have a thorough knowledge of automatic telephone systems and should be capable of organising and handling the actual work in the field. Preference will be given to applicants with a sound knowledge of crossbar automatic telephone exchange systems in particular.

The engineer appointed to the post will normally be resident in Bogota but will be required to travel to other parts of Colombia in the course of his duties. Actual travelling expenses plus an adequate living allowance will be paid for these trips. Travel between the principal cities of Colombia is rapid, as regular air services are available. The engineer will be expected to study and to learn the Spanish language.

The period of engagement will be three years in the first instance. Salary will be dependent upon qualifications and experience, but will be of the order of £375 per month, payable mainly in U.S. dollars and partly in Colombian pesos. Fuller details will be given to applicants selected for interview. In addition, social benefits recognised by the Colombian Labour Legislation will be paid in Colombian pesos.

Free passages to Bogota will be provided for the successful applicant and his family, up to a maximum of five persons, including himself, together with free return passages to England on the satisfactory conclusion of the contract.

Applications giving full details of training and experience, together with copies of any relevant testimonials, should be submitted to the Consulting Engineers, Messrs. Preece, Cardew & Rider, 8/12, Queen Anne's Gate, London, S.W.1.

767

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

West Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Mechanical) required at Rugeley Power Station, Rugeley, Staffs. N.J.B. service conditions, superannuable appointment. Salary according to Class L, Grade 8, Scale 12, £1,350-£1,500 per annum.

Applicants should have served an apprenticeship and possess technical qualifications of H.N.C. level or leading to Corporate Membership of a major engineering institution.

Wide practical experience of mechanical maintenance at a modern power station is essential.

Apply, quoting vacancy number 122/61 MD on form AE6 available from the Station Superintendent, Rugeley Power Station, Rugeley, Staffs., to whom they should be returned by 8th May, 1961. 824

NORTH WESTERN ELECTRICITY BOARD

Fourth Assistant Engineer,
Substations Section,
Sub-Area Engineering Dept., Manchester

The duties will include assisting with the installation and maintenance of transformers and switchgear for all voltages up to 33 kV, mercury arc rectifiers, rotary plant and ancillary equipment of all types. Manufacturing experience, including "on-site" erection, will be an advantage.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £1,040/£1,165 p.a., Grade M.13. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, and returned to him by the 8th May, 1961.

Third Assistant Engineer
(Operation and Maintenance),
Sub-Area Engineering Dept., Preston

Applicants should have had a wide experience in the construction, operation and maintenance of large industrial and rural networks, including overhead lines and underground cables at voltages up to 33 kV, and in high-voltage testing and fault localising.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £1,190/£1,325 p.a., Grade L.10. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, and returned to him by the 8th May, 1961.

772

CITY OF CARDIFF EDUCATION COMMITTEE

Llandaff Technical College

Principal: J. Cotterell, M.I.E.E., A.I.Mech.E.,
A.M.I.Prod.E.

Department of Electrical Engineering

APPLICATIONS are invited for the post of LECTURER in the Electrical Engineering Department to commence on 1st September, 1961. The Department provides Sandwich, Block Release and Part-time Day Courses for O.N.C., City and Guilds Technicians, Installation, Radio and Electronic Servicing. The successful candidate will be required to teach the electrical engineering subjects in these courses and in particular will be responsible for the organisation and development of the Electrical Technicians and Electronic Servicing Courses.

Salary in accordance with Burnham Technical Scale for Lecturers, £1,370 × £35 (4) plus £40 to £1,550.

Further particulars and application forms can be obtained from the undersigned and should be returned within 14 days of the appearance of this advertisement.

ROBERT E. PRESSWOOD,
Director of Education.
City Hall,
Cardiff.
766

BOROUGH OF HENDON

Borough Engineer and Surveyor's Department

Senior Mechanical and Electrical Engineer, Lettered Grade B

APPLICATIONS are invited for the above appointment in the Engineering Section at a commencing salary according to experience within Lettered Grade B (£1,475 to £1,670).

Applicants must be suitably qualified mechanical, heating or electrical engineers, and have had considerable experience of technical design problems, of heating and electrical installations in housing estates, schools and public buildings. Some knowledge of mechanical installations, including refuse disposal plant and mechanical equipment, is desirable.

Pensionable post; subject to appropriate J.N.C. conditions and medical examination.

Applications, with full details and names and addresses of two referees, must reach the Borough Engineer and Surveyor, Town Hall, Hendon, London, N.W.4, by Monday, the 15th May, 1961. Canvassing will disqualify.

R. H. WILLIAMS,
Town Clerk.
Town Hall, Hendon,
London, N.W.4.
806

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

Research and Development Dept. Chemist

APPLICATIONS are invited for the appointment of a CHEMIST in the Service Section Laboratory of the Regional Research and Development Department of the North Eastern and Yorkshire Region with headquarters at Leeds.

The Service Section is concerned with trouble shooting and short-term research projects directly associated with problems occurring in power station operation.

Candidates for the post must have an honours degree and/or A.R.I.C. with a wide experience of power station operation.

The salary for the appointment will be on a scale within the range of £1,350-£1,720 per annum.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 12th May, 1961.

792

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required at Llangefni. Salary within range £825/£940 per annum (N.J.B. E/9, Scale 5).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high and medium-voltage networks, with their associated substations and equipment.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, nr. Wrexham. Closing date 12th May, 1961.

828

SALES ENGINEER

BRUCE PEEBLES require a Sales Engineer of H.N.C. standard for their Transformer Contracts Section. 5-day week, staff pension scheme. Housing assistance given if necessary.

Apply giving details of experience and present salary to Divisional Director (Transformers), Bruce Peebles & Co. Limited, East Pilton, Edinburgh, 5, quoting ref. SE/ER.

833

TELEMETRY ENGINEER

LARGE Oil Company requires a TELEMETRY ENGINEER for service in the Middle East. Applicants should be Associate Members of the Institution of Electrical Engineers and have eight to ten years' experience in the electronic industry, which should include the operation and maintenance of telemetering and remote control equipment, preferably as applied to normal communication circuits. Knowledge of transistor applications, printed circuit techniques and electromechanical devices is essential.

It is desirable that applicants should also have experience of one or more branches of communications, i.e., carrier/repeater systems, V.F. telegraphs, exchanges and radio.

Pensionable post with gross pay not less than £3,000 per annum. Annual home leave with paid passages. Air-conditioned furnished accommodation provided for which rent is charged, but, owing to shortage of married accommodation, married applicants should be prepared for initial separation.

Applicants, aged 30-40, should write in detail, quoting No. 1022, to Box No. 4034, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4.

802

ADMIRALTY – NAVY WORKS DEPARTMENT

ELECTRICAL AND MECHANICAL ENGINEERING DRAUGHTSMEN

Vacancies exist in Navy Works Department Drawing Offices at the following Establishments:— Pinner (Middlesex), London, Chatham, Portsmouth, Portland, Devonport, Milford Haven, Liverpool and Rosyth and occur elsewhere in the United Kingdom from time to time.

The posts are non-pensionable but there will be opportunities for transfer to the Established Staff. Applicants must be competent Draughtsmen and experienced in one or more of the following types of work :—

ELECTRICAL

(*a*) Preparation of specifications, drawings and schedules for electrical equipment. Precis of Firms' tenders.
(*b*) Electrical installations in domestic and industrial buildings.
(*c*) Cable installations, switchgear, etc.
(*d*) Airfield lighting.
(*e*) Low Tension Power Distribution Systems and Telecommunications Wiring.

MECHANICAL

(*a*) Preparation of specifications, drawings, schedules for Mechanical Equipment. Precis of Firms' tenders.
(*b*) District heating, including boiler installations, heating and air conditioning of domestic and specialist buildings.
(*c*) Layouts of engineering installations and workshop machinery.
(*d*) All classes of lifting appliances, pumping installations, test plants, cooking equipment, etc.

Possession of O.N.C. or similar qualification will be an advantage. Consideration will be given to successful candidates being granted assistance to obtain technical qualifications.

Salary (Men): National Rate—subject to slight variation dependent on location: starting from £603 (at age 21) to £905 (28 and over); maximum of scale—£993 p.a. (National Rate).

Opportunities occur for promotion to Leading grade — salary maximum £1,160 p.a. (National Rate).

Five-day week: annual leave 18 days rising to 22 after 10 years.

Candidates, who must be British subjects, are invited to apply in writing, giving details of qualifications and experience to Director General, Navy Works, Admiralty, Chamberlain Way, Pinner, Middlesex, quoting ref. 45/96/125.

788

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

West Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Electrical) required at Rugeley Power Station, Rugeley, Staffs. N.J.B. service conditions, superannuable appointment. Salary according to Class L, Grade 8, Scale 12, £1,350-£1,500 per annum.

Applicants should have served an apprenticeship and have technical qualifications of H.N.C. level or leading to Corporate Membership of a major engineering institution.

Wide practical experience of the maintenance of heavy electrical plant and switchgear is essential.

Apply, quoting vacancy number 123/61 MD on form AE6 available from the Station Superintendent, Rugeley Power Station, Rugeley, Staffs., to whom they should be returned by 8th May, 1961.

825

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL ENGINEERS. Salary range £960-£1,310 p.a. plus £45 p.a. London allowance. Successful candidates will be paid according to age and experience and will receive approved removal expenses. Applicants should state salary they expect to receive. Must be A.M.I.E.E. and have had experience in design of large electrical services installations. The successful applicant must be capable of taking charge of works from commencement to final completion.

Full details, present salary and three copy testimonials, preferably one from present employer, to County Architect, County Hall, Kingston-upon-Thames, as soon as possible.

701

MANN EGERTON & CO. LTD.

require SENIOR ESTIMATING ENGINEER to take control of their Electrical Contracting Department Estimating Section. The successful applicant, preferably under 40, will have substantial experience of large industrial and commercial contracts from initial enquiry to final account.

This is a permanent appointment with a good salary according to age and experience, pension scheme, etc.

Apply in confidence to Reference CW., Electrical Division, Cromer Road Works, Norwich, NOR 38N.

809

HARTLEY ELECTROMOTIVES LTD. SHREWSBURY

require services of
ELECTRICAL ESTIMATOR
SUPERVISING ELECTRICAL ENGINEER
or ELECTRICIAN

willing to train for this progressive position. Good salary dependent on experience. Staff privileges, modern office with ideal working conditions. Housing assistance if required.

Apply General Manager, Wiring Systems Division.

775

ELECTRICAL DESIGNER/DRAUGHTSMAN

required for industrial drying machine manufacturers. Applicants should possess Higher National Certificate or equivalent and preferably have had experience of control gear and panels for rotating machines and heating. The successful candidate will be in charge of the small department which is responsible for the control equipment supplied with our products.

Written applications to Secretary, The Spooner Dryer & Engineering Co. Ltd., Moorland Engineering Works, Ilkley, Yorks.

8239

MARTINDALE ELECTRIC CO. LTD.

invite applications for the position of

TECHNICAL SALES REPRESENTATIVE

for the East Midlands Area

THE company manufactures a range of instruments and equipment in great demand in the electrical maintenance field and applicants should have a good knowledge of electrical engineering and a keen desire to join a progressive company engaged in selling to industrial and electrical organisations.

The applicants should be resident in the East Midlands area. A four-figure salary and expenses are offered, a company's car is provided and a pension scheme is in operation.

Please write in the first instance stating age, qualifications and details of experience to Sales Manager :—

MARTINDALE ELECTRIC CO. LTD.
Westmorland Road, London, N.W.9

814

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Croydon "B" Power Station

ASSISTANT SHIFT CHARGE ENGINEER (Vacancy No. 124/61). Applicants should have experience in a generating station and be conversant with the operation of P.F. boilers. Experience of labour control is essential, and applicants should preferably hold O.N.C. electrical or mechanical.

Salary N.J.B. Class J, Grade 8, £1,359 to £1,507 10s. per annum, including London and shift allowances.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey, to arrive by 12th May. 816

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEER is required at Nechells "A" and "B" Power Stations, Birmingham, for generation operation duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.15, £765-£870 per annum. An allowance of £90 is payable when engaged on shift duties.

Applicants should have received a sound technical training and should preferably have some industrial engineering experience and have appropriate technical qualifications.

Apply, quoting Vacancy No. 114/61MD, on form AE6, available from the Station Superintendent, Nechells Power Station, off Aston Church Road, Nechells, Birmingham, 7, by the 8th May, 1961. 791

AUTOMATIC CONTROL GEAR

Senior Engineer required

with experience in automatic contactor relay and hand operated motor and generator control gear. To take charge of design and application.

Some knowledge of electronic or magnetic servo control equipment desirable. Position is permanent.

Attractive remuneration with incentive bonus and contributory pension scheme.

Box No. 799

POWER PLANT ASSISTANT ENGINEER

Cable and Wireless Limited

require an Assistant Administrative Engineer at their Head Office in London. Applicants must have a good working knowledge of diesel engines, A.C. and D.C. generators and automatic control switchgear, together with ability to deal with specifications and relevant correspondence. Preference will be given to a young man aged about 25 who possesses O.N.C. in Electrical or Mechanical Engineering. The work is interesting and the position, which is permanent and pensionable, carries remuneration commencing at age 25 £693 per annum, with eligibility for annual progression to £1,205. Openings to £1,490 thereafter.

Apply in writing giving full details of age, qualifications and experience to Staff Manager, Cable and Wireless Limited, Mercury House, Theobalds Road, London, W.C.1. 796

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER (Vacancy No. ER/AV/41/61) required at Portishead "B" Power Station.

Superannuation scheme. Salary N.J.B. Class K, Grade 15, Scale 4, £765-£870 per annum.

Possession of, or at present studying for, a Higher National Certificate or similar qualification would be an advantage.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 8th May, 1961. 821

'ENGLISH ELECTRIC'

WHETSTONE, Nr. LEICESTER

offers opportunities to

DESIGNERS AND DRAUGHTSMEN

(Electrical and Mechanical)

in the following fields:
1. General Mechanical Engineering.
2. Plant layout for new project and contract work in connection with conventional power station plant.
3. Cabling installation work on machinery and equipment and automatic control circuits.
4. Lighting and power system design.
5. Preparation of Electrical diagrams.

The appointments are permanent and pensionable and the Company offers modern working conditions and welfare facilities.

Enquiries giving details of age, experience, qualifications and current salary (which will be treated in strictest confidence) should be addressed to the Technical Staff Officer, Dept. G.P.S., English Electric House, Strand, London, W.C.2., quoting reference ER1899V. 762

DRAUGHTSMEN

required in long-established and progressive company. Permanent and progressive position offered to men holding O.N.C. or equivalent who are used to producing a high standard of work and with experience in design layout and detailing in either of the following fields:—

A.C. AND D.C. ELECTRICAL MACHINES.

MOTOR CONTROL GEAR AND PANELS.

Details of qualifications and experience should be sent to the General Manager, Newton Brothers (Derby) Ltd., Alfreton Road, Derby. 749

ELECTRICAL ENGINEER

required for West Africa

APPLICANTS should preferably have experience in the electrical contracting industry, including preparation of specifications and estimates. Remuneration between £1,400 and £1,700 depending on age, qualifications and experience. Family allowances and pension scheme. Paid leave every 20 months with free passages for employee and family. Free furnished accommodation in Africa.

Please write giving full details to—Box 794.

CABLE REPRESENTATIVE

AN opportunity occurs in the Midland Region for the appointment of a REPRESENTATIVE based at our Birmingham office. He will be solely responsible for the control and development of existing cable sales throughout the region and his initiative will be fully supported by the company's sales and technical resources. It would be of advantage if applicants could offer an industrial connection and a knowledge of markets associated with cable sales.

Remuneration will be by basic salary, commission and expenses, and a car will be provided.

Apply in confidence, stating details of experience, to the Sales Manager, Cable Sales Division, Greengate & Irwell Rubber Company Ltd., Greengate Works, Manchester, 3. 774

SOUTH WALES SWITCHGEAR LTD.

have vacancy for

CHIEF RESEARCH AND DEVELOPMENT ENGINEER

in the company at the Blackwood headquarters. Applications are invited from suitable engineers having wide experience in electrical engineering spheres.

Applications will be treated in confidence and should be addressed to the Managing Director, South Wales Switchgear Ltd., Blackwood, Mon. 831

LIGHTING SALES ENGINEER

APPLICATIONS are invited for an experienced LIGHTING SALES ENGINEER for territory in SOUTH-WEST LONDON, SURREY and WEST KENT, preferably resident in the area.

Attractive salary is offered to applicant who has the required sales and technical experience. Car will be provided and opportunity will be given to the applicant to join the superannuation scheme.

Write in confidence giving details of age, sales experience, training, present salary, etc., to the:—

Southern Area Manager
THE BENJAMIN ELECTRIC LTD.
Brantwood Road, Tottenham
London, N.17

782

SENIOR ELECTRIC SUPPLY ENGINEERS

required for permanent appointments abroad with rapidly developing Electric Supply Company

VACANCIES are for top-level men to take charge of operating steam power stations and for men with good experience in the construction and maintenance of large substations and overhead lines.

Prospects good. Congenial, healthy climate. Superannuation scheme in operation and sea passages paid.

Applications in duplicate giving full details of age, qualifications, experience, etc., to—Box 765.

FOREMAN ARMATURE WINDER

required by leading London electrical repairs organisation.—Box 661.

Situations Vacant (continued)

TRANSFORMERS

INTERMEDIATE AND JUNIOR DRAUGHTSMEN required with some experience on power transformers in range 10 - 30,000 kVA. Permanent positions carrying excellent salaries according to experience.

Contributory pension and life assurance scheme in operation and canteen facilities provided.

Evening and Saturday interview can be arranged.

Write stating age, experience and education to :—

Chief Draughtsman
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey
808

AN experienced agent on commission basis with first-class connections in the wholesale domestic electrical appliances field by a leading manufacturer of electric blankets for the Lancashire area. Excellent accounts and prospects. Car ownership and highest references essential.—Box 768.

ARMATURE winders required, conversant A.C.-D.C. industrial repairs, by Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13 (Grangewood 4003). 753

ASSISTANT branch managers, salesmen, storekeepers and trainees required by Superlamp Ltd., electrical wholesalers, at their head office and branches in the Home Counties. Reply in confidence to — Managing Director, Superlamp Ltd., 72/76, Eversholt St., London, N.W.1. 703

ASSISTANT electrical engineers with at least H.N.C. and 2/3 years' experience of E.H.V. transmission work required by consulting engineers in their contracts and design department, Weybridge. Applications stating age, qualifications, experience and salary required to Kennedy & Donkin, 12, Caxton Street, London, S.W.1, quoting ref. RWMc. 810

ASSISTANT engineer required by consulting engineers in their head office. Experience required in design and contract work of tower and wood pole lines. Applications stating age, qualifications, experience and salary required to—Kennedy & Donkin, 12, Caxton Street, London, S.W.1, quoting ref. JGW/HSJ. 750

ASSISTANT engineer required for wood pole line contracts in Scotland. — Ref. J.H.P., B. French Limited, Kidderminster. 590

BUYER to take complete charge of purchasing department in rapidly expanding organization dealing with companies engaged in electronics. Knowledge of electro-magnetic relays an asset. Must be capable of working entirely on own initiative and commanding minimum commencing salary of £1,000 p.a. Pension scheme available. Apply in own handwriting to—Box 836.

CLERICAL assistant reqrd. for Blackfriars and Gravesend offices. Knowledge of electrical trade desirable. Progressive position. —London Electrical Co., 92, Blackfriars Road, London, S.E.1. 680

CLERK of works for mechanical and electrical engineering services installations contracts at Topsham Barracks, Exeter, rebuilding programme. The appointment will be for a period of approx. two years commencing from September, 1961. A similar appointment is to be made for Seaton Barracks, Plymouth, for a period of approximately two years from May, 1962. Forms of application available from—Hoare, Lea & Partners, Consulting Engineers, 5, Headland Park, Plymouth. 722

CONSULTING engineers require intermediate design-draughtsman for electrical services. Excellent promotion prospects in expanding practice. Write—Locke & Beal, 303/307 Balham High Road, London, S.W.17. 608

ELECTRICAL engineer required with extensive knowledge of English and European electrical standards. To work upon domestic electrical appliances for sale in United Kingdom and Continental markets, also the adaptation of American appliances to European standards. Must be prepared to stay for lengthy periods each year in United States. Write giving full details to—Personnel Officer, Ref. 207, Ronson Products Ltd., Leatherhead, Surrey. 776

DESIGNER required for L.T. switch and fusegear. Apply by letter giving details of experience and salary required to—Wm. Sanders & Co. (Wednesbury) Ltd., Ridding Lane, Wednesbury, Staffs. 751

ELECTRICAL engineer, qualified, required by Warrington firm of consulting engineers to take charge of their electrical section. General experience covering industrial power and lighting, and possibly electronics, is essential. Apply stating age, experience and salary required to—Box 8236.

ELECTRICAL fitter-wiremen required for all types of control cubicles. Telecommunication work an advantage. Apply—Troughton & Young (Manfrs.) Ltd., 18, Beddington Farm Road, Purley Way, Croydon. 811

ELECTRICAL supervisor wanted for British company Nigeria. Free passages, quarters and medical expenses. Tours normally 21 months with 5 days' leave for every month's service. Applications with copies of testimonials and certificate of apprenticeship by air to—P.M.B., 1048, Apapa, Nigeria. 8233

ELECTRICIAN wanted by well-known contractors N.W. London area. Only those having experience of good-class contracts need apply. Regular employment, pension scheme and housing to suitable applicant. Write full details—Box 777.

ENGINEER representative required for London and Home Counties by electrical manufacturing and repair organisation. Please write giving full details of career to date.—Box 752.

ESTIMATING engineer for electrical contractors. Sound practical experience essential. Some drawing experience preferred. Salary £850 plus non-contributory pension scheme.—Morley's Installations Ltd., 117, Hornsey Road, London, N.7. 778

GENERAL foreman required for wood pole line contracts in Scotland. — Ref. J.H.P., B. French Limited, Kidderminster. 589

INVOICE clerk, male, required for cable contractors, Central London. Good salary and prospects.—Box 725.

LABORATORY manager. Physicist (preferably under 40) required to take charge of research, development and routine work in the photometry and general laboratories of Holophane Limited. Some familiarity with techniques of measurement of light and heat is desirable. Successful applicant will be expected to maintain personal contact with clients, technical associations and manufacturers, involving some travel. Company pension scheme. Applications, which will be treated in confidence, should be made fully in writing to — The Technical Director, Holophane Limited, Elverton Street, London, S.W.1. 784

SALES clerk required with experience in estimating for rubber and thermoplastic cables of all types. Staff pension scheme and canteen facilities available. Reply to — Sales Manager, General Cable Mfg. Co. Limited, Leatherhead, Surrey. 769

SALES representative required, having live, well-established connection with contractors, wholesalers, architects, etc., for London and Midland areas, by manufacturers of electrical wiring accessories. State age and extent of connection. Existing staff have been advised of this advertisement.—Box 705.

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, Spring and Summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 142

SIEMENS-SCHUCKERT (Great Britain) Ltd., Great West Road, Brentford, Middx., have a vacancy in their switchgear sales department for an assistant electrical engineer. Applicants should have had good engineering training and be able to deal with enquiries and orders for electrical control gear and associated equipment. A knowledge of German is an advantage but not essential. Pension and bonus schemes in operation. Write fully, marked "Confidential," to Sales Manager, "V" Department. 812

SUPERVISING engineer, experienced, required by expanding firm of electrical contractors N.W. London. Progressive position. Pension scheme. Write stating age and experience to—Box 196.

SOUTH WALES SWITCHGEAR Limited have vacancy for chief insulation engineer at the Blackwood factory in Monmouthshire. Applications are invited from engineers having appropriate experience and academic qualifications. Please forward applications which will be treated in confidence to the Personnel Manager, South Wales Switchgear Limited, Blackwood, Mon. 832

SUPERVISING electrical engineer for electrical contractors' London office able to prepare schemes and estimates and carry through to account stage. Progressive, pensionable situation. Write—W. J. Furse & Co. (London) Ltd., 22, Alie Street, Aldgate, London, E.1. 666

SURVEYOR required for wood pole line contracts in Scotland.—Ref. J.H.P., B. French Limited, Kidderminster. 588

TECHNICAL manager required for West London electrical equipment manufacturing company. Experienced knowledge of circuit breakers and control gear required, with awareness of the requirements of flameproof equipment. Applications are invited from qualified electrical engineers for this senior appointment, with age not exceeding 45 years. The appointment is pensionable and applicants are requested to submit full details of technical qualifications, experience and training, etc., to — Managing Director, c/o Box 532.

TEMPORARY clerk of works (electrical) required in connection with Council's extensive housing programme. Present salary £16 2s. 9d. per week. Superannuable post. Applicants should have served an indentured apprenticeship in the electrical contracting industry and should have a good knowledge of all types of installations and I.E.E. regulations. Experience in a similar position and knowledge of underfloor heating systems an advantage. Applications on forms obtainable from the Borough Engineer and Surveyor, Civic Centre, Southampton, returnable by Wednesday, 10th May, 1961. 817

TRANSFORMER development engineer to be responsible for impulse testing and other interesting development work in an expanding organisation. Good salary and prospects for suitable applicant. Reply in confidence, stating age, experience and qualifications. —Box 627.

WORKING electrical supervisor required for Nigeria by British-owned company handling all types electrical contracts. Generous salary and leave. Free passages, accommodation, transport, etc. Write—Box Z.Z. c/o J. W. Vickers & Co. Ltd., 7, Great Winchester Street, London, E.C.2. 797

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

COMPLETELY mobile bachelor, London, of good education and appearance with seven years' auditing and accountancy and twenty-two years' electrical experience (4 installations, 2 site cable supervision, 3 outside expediting, balance —all aspects material control) seeks travelling post in equipment expediting, auditing and/or control, liaison duties or equivalent. Good salary and conditions. Please write—Box 7714a.

ELECTRICAL engineer (O.N.C.), experience as estimating, supervising and design engineer in electrical installations, seeks new position, preferably overseas.—Box 8237.

ELECTRICAL fitter seeks job erecting, installing electrically driven machines, switchgear, etc. Fully experienced electrician. Work on own initiative. Reliable.—Box 8238.

ENGINEER electrical, age 35, who is not afraid of work, returns U.K. May-June and seeks progressive remunerative appointment, home or overseas. Experienced in most aspects of a supply company as well as contracting and maintenance.—Box 337.

ENGINEER/estimator, 20 years with London's leading contractors, wishes change; enquiry to accounts.—Box 8240.

EXPERIENCED linesman desires situation on overseas contracts. Recently completed 6½ years abroad.—Box 7710.

REPRESENTATIVE / manager / buyer, 18 years' comprehensive experience electrical trade, seeks change.—Box 8232.

ARTICLES FOR SALE

600

WARD LEONARD SETS 415/3/50 INPUT

WORK MOTOR DETAILS

H.P.	Volts.	Speed.	Enclosure.	Maker.
0/250/250	0/230	0/525/800	Drip Proof	MATHER & PLATT
0/220	0/230	0/1750	Drip Proof	WESTINGHOUSE (U.S.A.)
0/200/200	0/230	0/750/960	S. Prot.	G.E.C.
0/130/150	0/500/500	0/360/460	Drip Proof	MATHER & PLATT
0/120	0/230	0/960	S. Prot.	G.E.C.
0/95	0/220	0/1500	P. Vent.	ALLEN
0/73/73	0/480/480	0/1200/1500	Drip Proof	HARLAND
0/60/60	0/225	0/1300/1500	Drip Proof	ALLEN
0/45	0/210	0/2700	S. Prot.	L.S.E.
0/35	0/250	0/1250/1500	Drip Proof	MAWDSLEY

Selection only; Commutator Motors, 400-cycle Alternators and other electrical equipment available for prompt delivery.

GEORGE COHEN
SONS & CO. LTD.
Wood Lane, London, W.12
(Shepherds Bush 2070)
Stanningley, Nr. Leeds
(Pudsey 2241)

770

MOTORS

NEW CROMPTON PARKINSON, from ¼ h.p. to 80 h.p.; also 6,000 A.C. and D.C. reconditioned Motors and Starters.

IN STOCK HERE

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Brantwood Rd., Tottenham, London, N.17
Tel. EDMonton 4621-2 215

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish, vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622. 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS for sale from 1,000 kVA at 750 r.p.m. down to ½ kVA. Single and three-phase. All voltages. More than 150 machines in stock. Automatic regulators and switchboards available.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

CIRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motor, Metropolitan-Vickers, 3-phase, induction motor, slipring, 17½ h.p., 415 volts, 720 r.p.m. Complete with drum type starter and starting resistance and contactor. Also cast iron bedplate for motor. Installed 1932, used only one day a week.—Sharman & Co. Ltd., Printers, March, Cambridgeshire. 779

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

FLUORESCENT tubes reconditioned and guaranteed with a life as new from 7s. 6d. each. Free collection and delivery in Lancs and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Clive Street, Bury (Telephone, Bolton 27251). 212

FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

FRACTIONAL h.p. motors down to 1 r.p. week. 250 Hoover motors always in stock. 11 different ratios of David Brown gear boxes always available means a motorised unit from stock. From—Jearys, 132, East Road, London, N.1. 126

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

INSULATING varnish, clear, Minerva No. 720, £10 per 40-gal. drum.—Lowton Metals Ltd., Sandy Lane, Lowton St. Mary's, Leigh, Lancs. (Tel. 71441/2). 93

KARDEX, Roneodex and Shannovue cabinets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

LAURENCE Scott alternator, 125 kVA, 440/3/50, slow speed, 375 r.p.m. Complete with exciter. Mounted on bedplate. Switchboard. In excellent condition. £395.—Speed Electrics, Dept. ER., Church Street, Basford, Nottingham (Tel. 75716). 573

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS and control gear, huge stocks all types, ¼ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (5444/7). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screw & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton (Elmbridge 2234/5/6). 172

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500-kW, 220-volt Met.-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire, 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

ARTICLES WANTED

WANTED

D.C./A.C. Motors, Transformers, Cables and all redundant Power Station plant wanted for dismantling.

ASK US TO QUOTE

B. M. T. CO. LTD.
London Road, Barking
(RIP. 3387/3715)

298

***Articles Wanted** (continued)*

WANTED FOR CASH

SURPLUS Diesel Generating Sets, all sizes up to 1,000 kW. We dismantle and remove.

DAWSON-KEITH LTD.
Hillview Road, Sutton
(Fairlands 4401/2/3) 47

A.C./D.C. electric motors, generators, transformers, disused stocks of cable, power houses bought and dismantled.—Samuel Hyams, 129, Lams Lane, Rainham, Essex (Rainham 4896). 125

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WANTED, 3-phase transformer, input 346-400 v., 230 v., output 6½-12½ kVA, 50 cyc.—Towse, 274, Promenade, Blackpool. 8235

150-h.p. variable speed motor wanted, with speed range of either 1,800/450 r.p.m. or 1,450/360 r.p.m. 415 volts, 3-ph., 50 cycles, complete with control equipment.—Vinatex Ltd., Devonshire Road, Carshalton, Surrey. 668

BUSINESS OPPORTUNITIES

SMALL ENG. CO. is interested in the acquisition of or trading agreement with a small electrical co. producing F.H.P. electric motors.

Box 834

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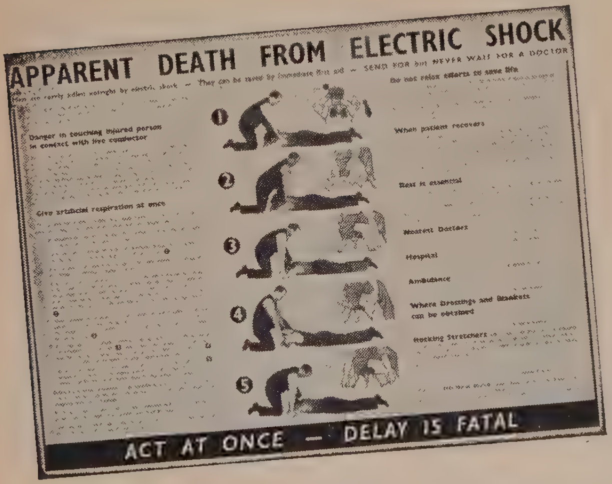
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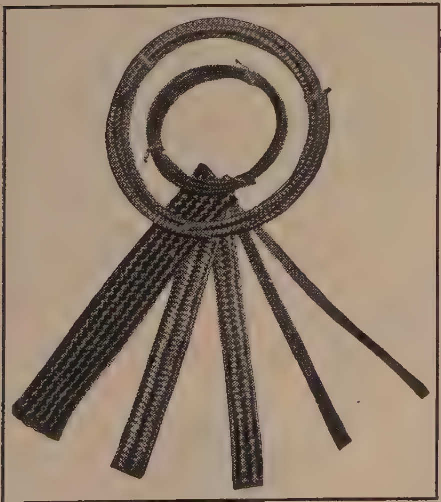

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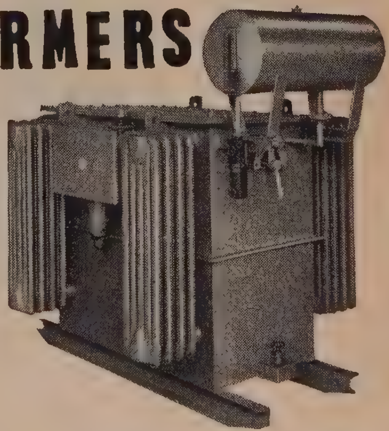

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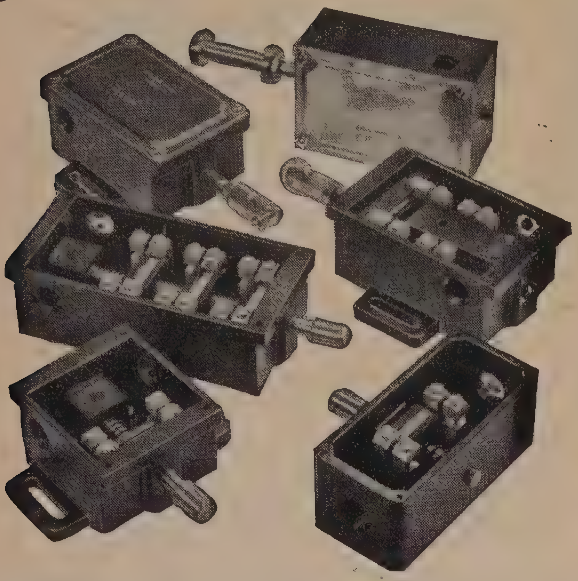

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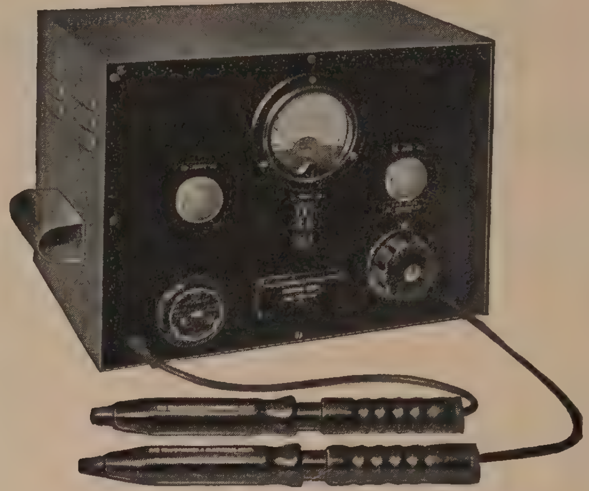

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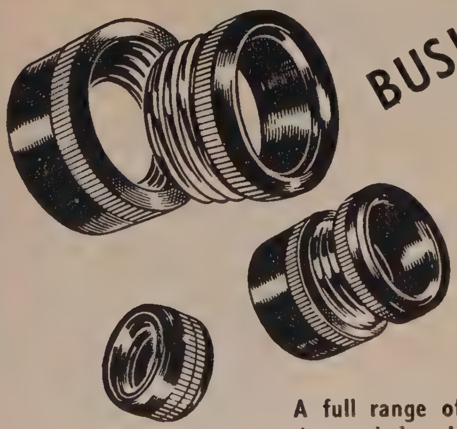

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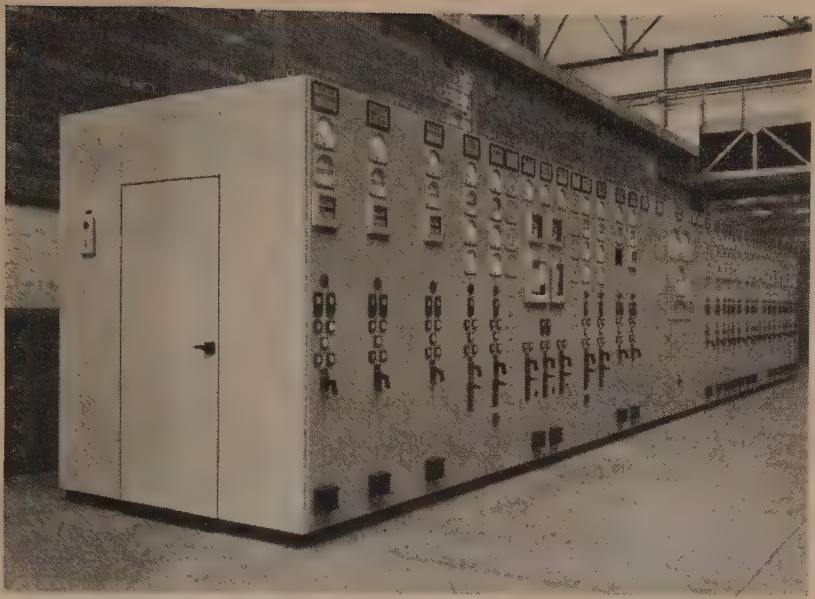

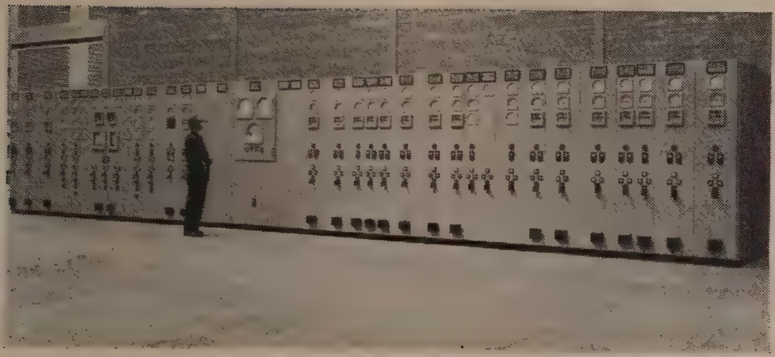

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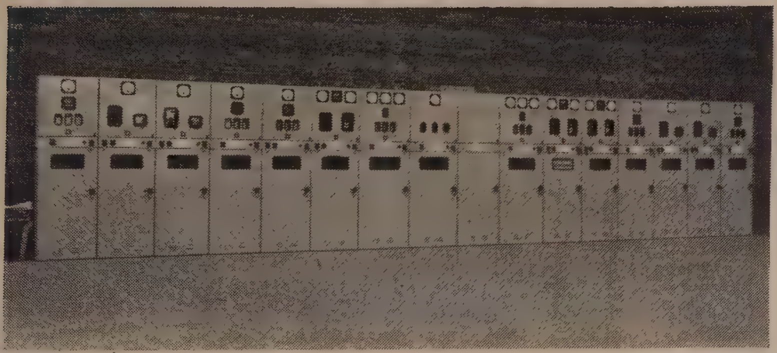

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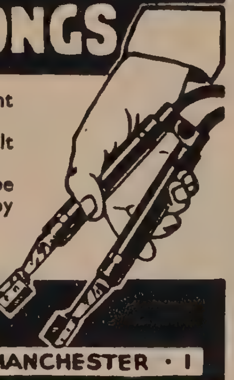

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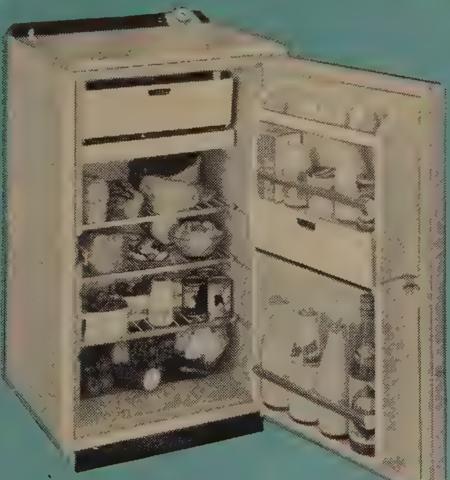

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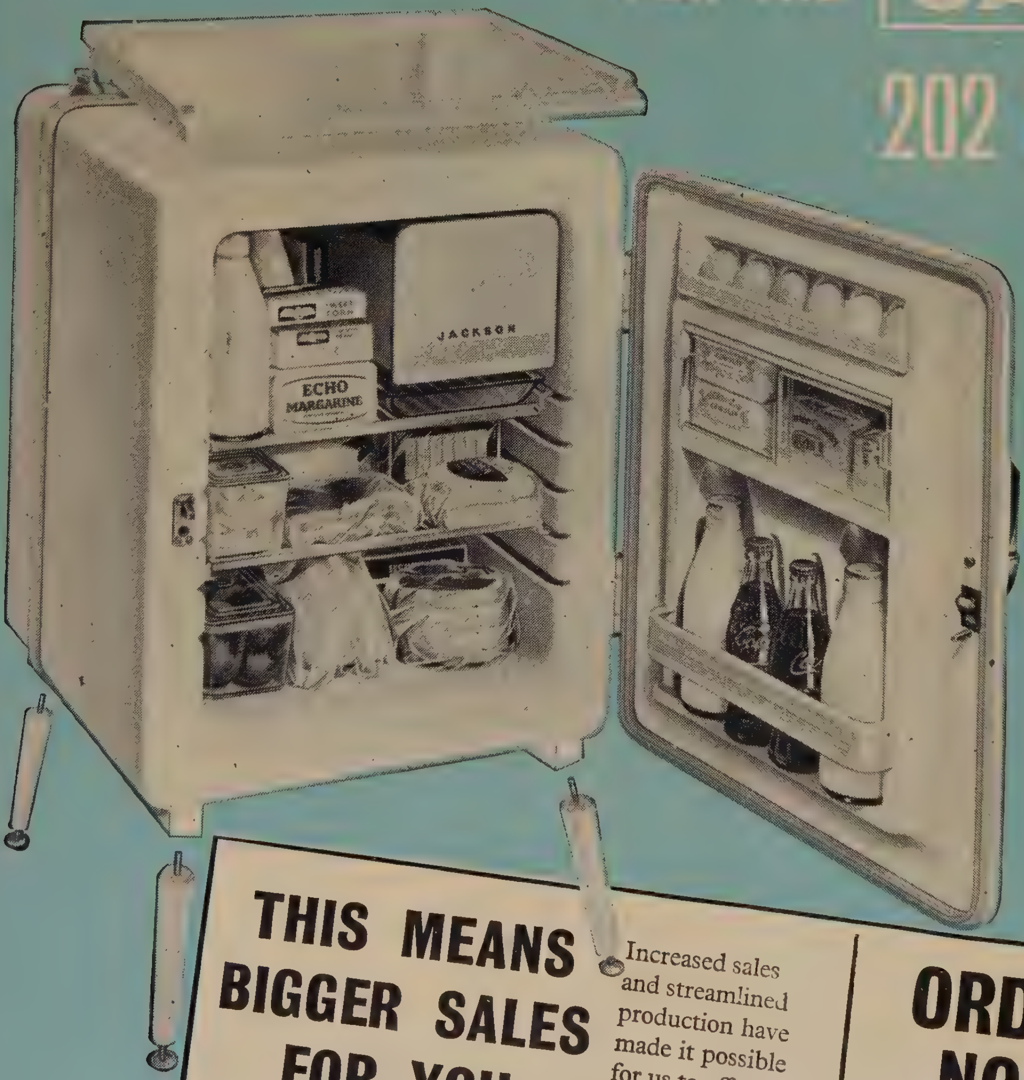

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REFRIGERATORS

DESPITE the difficulties experienced by the domestic refrigeration industry last year—the setback in sales having been attributed to not only the poor summer but also the Government's economic policy—there is every indication that this year, with the introduction of many new models and designs and, in several cases, a reduction in prices, sales will once again be on the upgrade. In fact the February figures showed a good improvement.

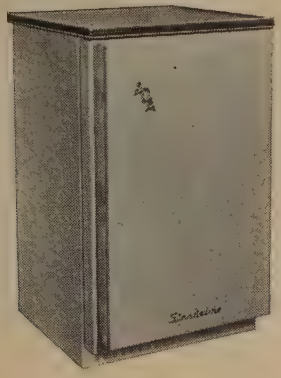
It is also encouraging to note that 22 per cent of the homes in this country now possess a refrigerator. The figure may not seem high when compared with such countries as the United States, Canada and Australia, but it must be borne in mind that as recent as five years ago it was estimated that only 8 per cent of British homes were so equipped and the refrigerator was at that time regarded as a luxury.

As the following survey shows, there are refrigerators now on the market to suit all pockets and tastes, ranging in size from approximately 1·5 cu ft to 10 cu ft and costing from about £30 to £150 and upwards (including purchase tax, at present at the rate of 25 per cent). The most noticeable trend is towards the provision of extra storage space for frozen foods. More manufacturers are incorporating this facility in their current smaller models where previously it was only obtainable in the larger refrigerators. Plastic materials, in attractive colours, are being used more extensively for the food compartment liners, and the outside cabinets, usually stove enamelled in either cream or white, are designed on "square" lines with doors that open within their own width. Because of the limitation of kitchen space in this country, the refrigerators most in demand are the table top types—those measuring about 36in high by about 20 to 22in square—in sizes ranging between 2½ and 4½ cu ft.

Several manufacturers charge a fee to cover installation costs, usually between £2 and £3, and where this is the case the sum has been added to the retail price and all prices listed in this survey include such additions.

COMPRESSOR

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
ADA (HALIFAX), LTD., **Johnson Street,** **Halifax.**	"Ada Slendaline"	4·5 cu ft 9·4 sq ft	$36 \times 21\frac{1}{2} \times 24\frac{5}{8}$	Interior light, rollers, plastic interior, working top, L. or R.H. door	White or cream stoved enamel	£55 18 6	£10 4 6
	"Ada"	4·5 cu ft 8·8 sq ft	$36 \times 21\frac{1}{2} \times 24\frac{7}{16}$	Interior light, rollers, full width freezer, working top, L. or R.H. door, magnetic door gasket	White or cream stoved enamel	£55 18 6	£10 4 6
	"Ada"	3 cu ft 6 sq ft	$33 \times 19\frac{7}{16} \times 20$	Full width freezer, mounted on rollers, magnetic door gasket	White or cream stoved enamel	£42 12 2	£7 15 10
A.E.I.-HOTPOINT, LTD., **33, Grosvenor Place,** **London, S.W.I.**	Hotpoint "Iced Diamond" E/F37	3·7 cu ft 7·1 sq ft	$36 \times 21 \times 21$	Interior light, mounted on rollers, L. or R.H. door opening, inner door panel with egg & bottle racks, etc.	White or cream, with optional red, blue, green, white or cream vitreous enamel table top	£50 14 3 £2 17 7 (Table top)	£9 2 9 £0 5 5
	Hotpoint "Iced Diamond" E/F50	5 cu ft 10 sq ft	$36 \times 24 \times 24$		White or cream, with red, blue, green, white or cream vitreous enamel table top	£62 4 2	£11 5 10
ALLIED IRONFOUNDERS, LTD., **Electrical Appliances Divn.,** **30, Orchard Street,** **London, W.I.**	"Leisure" 55	5·5 cu ft 11 sq ft	$44 \times 22 \times 25$	Interior light, full width freezer	White stoved enamel	£68 0 4	£10 14 8



1

1. *Ada (Halifax) 4·5 cu ft "Slendaline"*
2. *A.E.I.-Hotpoint model E/F37 3·7 cu ft "Iced Diamond"*

2

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
BAUKNECHT (G.B.), LTD., **1-9, Dover Yard,** **Berkeley Street,** **London, W.1.**	" Beekay " T.115A	3·9 cu ft Area not stated	32¼ × 21 × 25	Interior light, plastic interior, flavour protection (automatic defrosting K.195 and T.125 only)	White stoved enamel	£43 18 10	£8 0 8
	" Beekay " T.120	4·5 cu ft Area not stated	32¼ × 21 × 25			£52 7 6	£9 11 6
	" Beekay " T.125	4·5 cu ft Area not stated	32¼ × 21 × 25			£55 0 10	£10 1 2
	" Beekay " T.140	5 cu ft Area not stated	34½ × 23 × 27			£57 14 0	£10 11 0
	" Beekay " K.155	5·5 cu ft Area not stated	41 × 22 × 27½			£61 5 1	£11 3 11
	" Beekay " K.195	7 cu ft Area not stated	45¼ × 23½ × 26¾			£87 17 8	£16 1 4
BENDIX HOME APPLIANCES, LTD., **Albion Works,** **Kingsbury Road,** **Birmingham, 24.**	391	3·7 cu ft 8·5 sq ft	39 × 20 × 20	Interior light, non-slam door latch, crisper drawer	White or cream stoved enamel	£49 11 1	£8 13 11
	301	4 cu ft 8·5 sq ft	36 × 22 × 25	Interior light, removable table top in grey, yellow or green	White or cream, champagne and coral plastic interior	£50 16 5	£8 18 7
	401	4·5 cu ft 9 sq ft	43 × 20 × 20	Interior light, " Alufroid " light alloy inner lining, non-slam door latch, full-width freezer (cheese tray with special moistener, 683 and 983 only)	White or cream stoved enamel	£59 5 6	£10 9 6
	593	6 cu ft 10 sq ft	42 × 23 × 26			£67 14 8	£12 0 4
	683	7 cu ft 12 sq ft	48 × 23 × 26			£84 15 11	£14 19 1
	983	10 cu ft 15 sq ft	57 × 26 × 30			£106 2 10	£18 17 2
BOSCH, LTD., **20, Carlisle Road,** **The Hyde,** **Hendon, N.W.9.**	155 WG	5·5 cu ft Area not stated	33 × 39 × 19	Wall mounting, two doors	White	£74 12 0	£13 12 0
	110 E	3·9 cu ft 6·5 sq ft	34¼ × 21⅝ × 25⅝	For building-in	White	£55 2 7	£9 19 5
	112 TL	4 cu ft 6·5 sq ft	34¼ × 21⅝ × 25⅝	Interior light, blue heatproof table top, R. or L.H. doors	White	£56 0 4	£10 2 8
	140 TL	5 cu ft 8·6 sq ft	34⅝ × 22⅞ × 27½			£60 8 8	£10 19 4
	140 TG	5 cu ft 8·6 sq ft	34⅝ × 22⅞ × 27½			£64 17 1	£11 15 11
	140 S	5 cu ft 9·6 sq ft	44¾ × 22 × 28	Interior light, S=box type freezer, SG=full-width deep freezer	White	£63 19 5	£11 12 7
	140 SG	5 cu ft 8·3 sq ft	44¾ × 22 × 28			£70 3 2	£12 15 10
	180 S	6·4 cu ft 12·9 sq ft	48½ × 24⅞ × 28			£78 2 4	£14 5 8
	180 SG	6·4 cu ft 11·8 sq ft	48½ × 24⅞ × 28			£83 8 5	£15 5 7
	240 SG	8·5 cu ft 14·8 sq ft	55⅛ × 26⅜ × 28			£99 6 8	£18 5 4

3

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3. *Bendix model 683 7 cu ft refrigerator*
4. *Easiclene 2·5 cu ft " Two-Five " refrigerator on legs*
5. *Bauknecht model T.140 5 cu ft " Beekay "*

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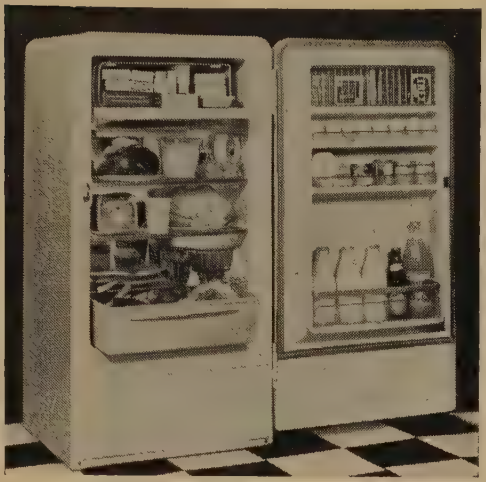

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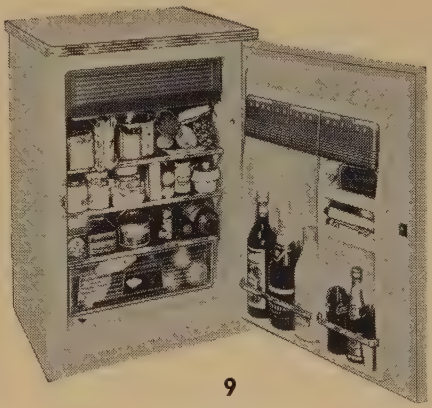
6. Bosch model 155WG 5·5 cu ft wall mounted refrigerator

7. Allied Ironfounders 5·5 cu ft "Leisure"

8. Denham & Morley 3 cu ft "Fridgemaster"

9. Bylock model 13T 4·6 cu ft refrigerator



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Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
BYLOCK ELECTRIC, LTD., **South Street,** **Enfield,** **Middlesex.**	"Bylock" 13T	4·6 cu ft 8·5 sq ft	33½×24×22½	Interior light, table top, storage for large bottles. Door opens within own width	White	£58 11 9	£10 14 3
DENHAM & MORLEY, LTD., **173-5, Cleveland Street,** **London, W.1.**	Scharpf "Fridgemaster" 300	3 cu ft Area not stated	33×19½×21	Full-width freezer, magnetic door closing, vitreous enamel working top	White stoved enamel	£45 19 6	£8 12 6
EASICLENE PORCELAIN ENAMEL (1938), LTD., **Lord Street,** **Wolverhampton,** **Staffs.**	Easiclene "Two-Five"	2·5 cu ft 4·8 sq ft	36×20½×20¼	Plastic interior and door shelves	White or cream, blue interior	£40 16 8	£7 9 4
	Easiclene "Four-two"	4·2 cu ft 7·8 sq ft	36×24×26	Interior light, plastic interior and door shelves, mounted on rollers	White or cream, blue interior	£51 9 9	£9 8 3
	Easiclene "Five-Five"	5·5 cu ft 9·4 sq ft	36×24×25¼	As above plus egg-rack	White or cream, blue interior	£61 5 0	£11 4 0
EDMUNDSONS SUPPLY CORPORATION, LTD., **240-250, Ferndale Road** **London, S.W.9.**	"Frimatic" 110	4 cu ft 6·5 sq ft	33½×20½×23½	Interior light, deep freeze facilities (except Model 110), shelves of unbreakable "No-oxyd" material, single piece polystyrene pink or white interior	Coral, green, ivory, yellow, blue, white or black	£45 5 5	£8 5 7
	"Frimatic" 140	5 cu ft 7·5 sq ft	44½×21½×22½			£61 5 0	£11 4 0
	"Frimatic" 162	5·75 cu ft 10 sq ft	48½×22×23½			£70 2 6	£12 16 6
	"Frimatic" 200	7 cu ft 10·5 sq ft	51½×23½×25			£82 11 0	£15 2 0
	"Frimatic" 260 DF	9·25 cu ft 15·5 sq ft	56×27×26			£106 10 6	£19 9 6

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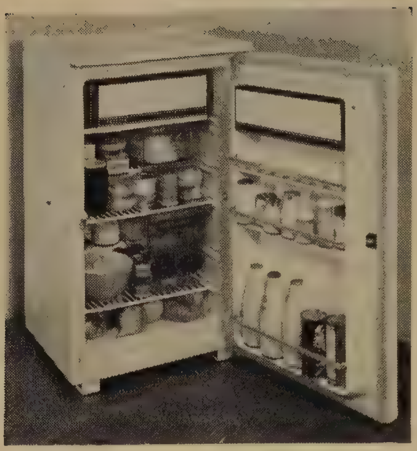

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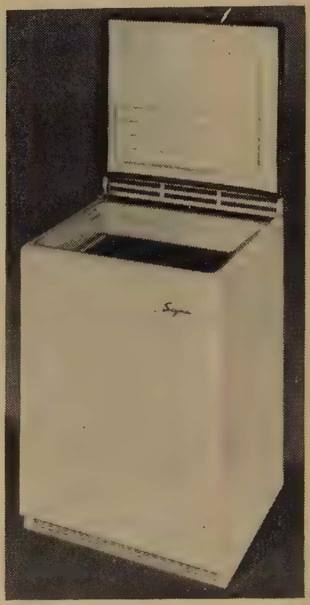

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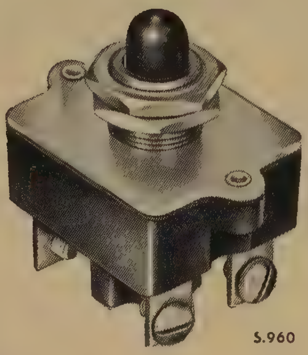
10. *Edmundsons model 200 7 cu ft "Frimatic"*
11. *English Electric 4·1 cu ft "Slimline 41"*
12. *Electro Appliances & Equipment T.T.90 "Sigma" deep freezer*

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
ELECTRO APPLIANCES & EQUIPMENT, LTD., **177, Regent Street,** **London, W.1.**	"Sigma" S.130	4·8 cu ft 8·5 sq ft	45½ × 23¼ × 24½	Interior light, de-frosts without removal of contents, door lock	White or cream	£51 19 5	£9 19 7
	"Sigma" T.15	4 cu ft 8 sq ft	32¼ × 22½ × 26			£55 16 3	£10 6 9
	"Sigma" T.L.40	5 cu ft 9·8 sq ft	33½ × 23¾ × 23¾			£61 2 9	£11 6 3
	"Sigma" T.T.90	3·2 cu ft	33½ × 23¼ × 23½	Deep freeze cabinet, three storage baskets, top opening	White stoved enamel	£75 9 1	£13 15 11
ENGLISH ELECTRIC CO., LTD., **East Lancashire Road,** **Liverpool, 10.**	"Slimline Junior" 7505	2·7 cu ft 6 sq ft	32 × 19 × 20	Full-width freezer tray, magnetic door seal	White or cream, lilac and clover interior	£42 12 2	£7 15 10
	"Slimline Popular" 7504	4 cu ft 6·8 sq ft	37 × 20 × 23	Table-top working surface		£53 8 0	£9 15 3
	"Slimline 41" 7506	4·1 cu ft 7·5 sq ft	36 × 21 × 22	Table-top working surface, full-width deep-cold freezer	White. Interior in two shades of blue	£55 18 6	£10 4 6
	"Slimline 60" 7105	6 cu ft 10·3 sq ft	41 × 22 × 23	Full-width deep-cold freezer, interior light		£71 8 0	£13 1 0
	"Slimline 77" 7106	7·7 cu ft 11·78 sq ft	46 × 24 × 26	Full-width deep-cold freezer, interior light, push-button defrosting		£92 3 0	£16 17 0
	"Slimline 94" 7107	9·4 cu ft 13·15 sq ft	54 × 24 × 26	Full-width deep-cold freezer, interior light, push-button defrosting		£105 13 7	£19 6 5
ENGLISH ROSE KITCHENS, LTD., **Wharf Street,** **Warwick.**	"Double-Six"	6 cu ft 11½ sq ft	66 × 30 × 24	Vertical sliding door. Additional 6 cu ft storage space	White or cream, or blue, pink, green or grey with white door face	£110 0 0	£20 15 7
	"Dual Freeze" E.R.50	4 cu ft plus 1·25 cu ft deep freeze. 5 sq ft	36 × 42 × 22	30 lb compartment for frozen foods	White, cream or sea-green	£140 10 0	£26 10 10
	E.R.93	3 cu ft 6 sq ft	36 × 21 × 22	Stainless steel or "Formica" working top	White, cream or sea-green	£61 0 0	£11 10 6
A. J. FLATLEY, LTD., **Irwell Bank Mills,** **Stoneclough,** **nr. Manchester.**	"Iceberg"	4·6 cu ft 6 sq ft	36 × 23 × 24	Interior light, plastic gliders, 7 lb frozen food storage	White stoved enamel	£35 5 9	£5 13 3
FRIGIDAIRE DIVISION OF GENERAL MOTORS, LTD., **Stag Lane,** **Kingsbury, N.W.9.** *(continued on next page)*	MB-30	2·9 cu ft 4·9 sq ft	33¼ × 19⅝ × 19	Interior light, frozen food compartment, 12-position cold control, plastic liner, hydrator, L. or R.H. door	White, cream, green, pink or red	£43 14 7	£7 14 5
	MB-40T	3·8 cu ft 7·8 sq ft	35¾ × 21 × 20⅞			£52 13 8	£9 5 4
	DB 50	5·1 cu ft 10·5 sq ft	45 × 21 × 20⅞			£61 11 2	£10 17 10

Arcolectric

Switches

Neon Signal Lamps



S.960

S.L.160, S.L.162 and S.L.163

New miniature low cost Neon Signal lamps.
½" hole fixing. All completely waterproof.
The S.L.163 has small front of panel projection.

C.S.200: 15-AMP Rotary Cooker Switch.
Double Pole three "heat" and "off".

S.L.50: Neon Signal Lamp with snap-in fixing.

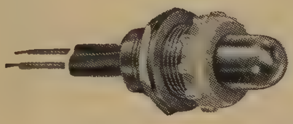
M.30: 10-AMP Toggle Switch.

S.L.190: New Snap-in fixing Neon Signal Lamp

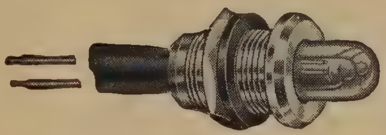
S.254: AC only 10-AMP Toggle Switch, double pole.

S.250: A single pole version of the S.254.

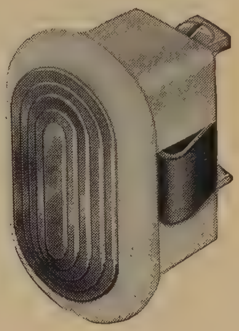
S.960: New Spin Drier Switch, double pole.



S.L.160



S.L.162



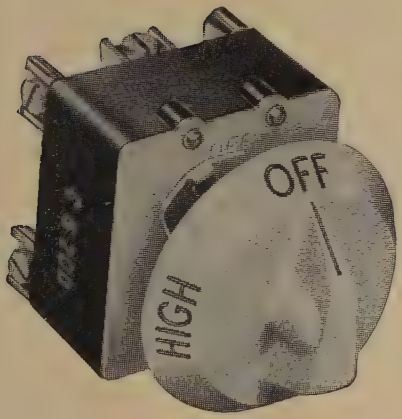
S.L.50

S.L.190

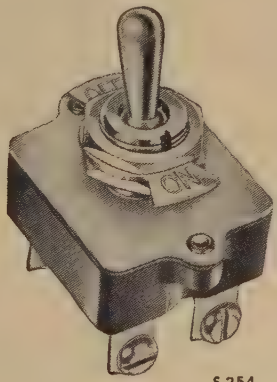
Write for Catalogue No. 132

Arcolectric Switches Ltd.

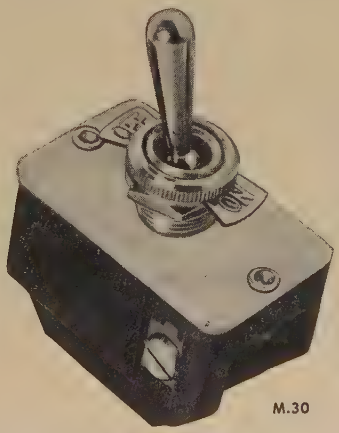
Central Avenue - West Molesey - Surrey - Tel: Molesey 3232



C.S.200

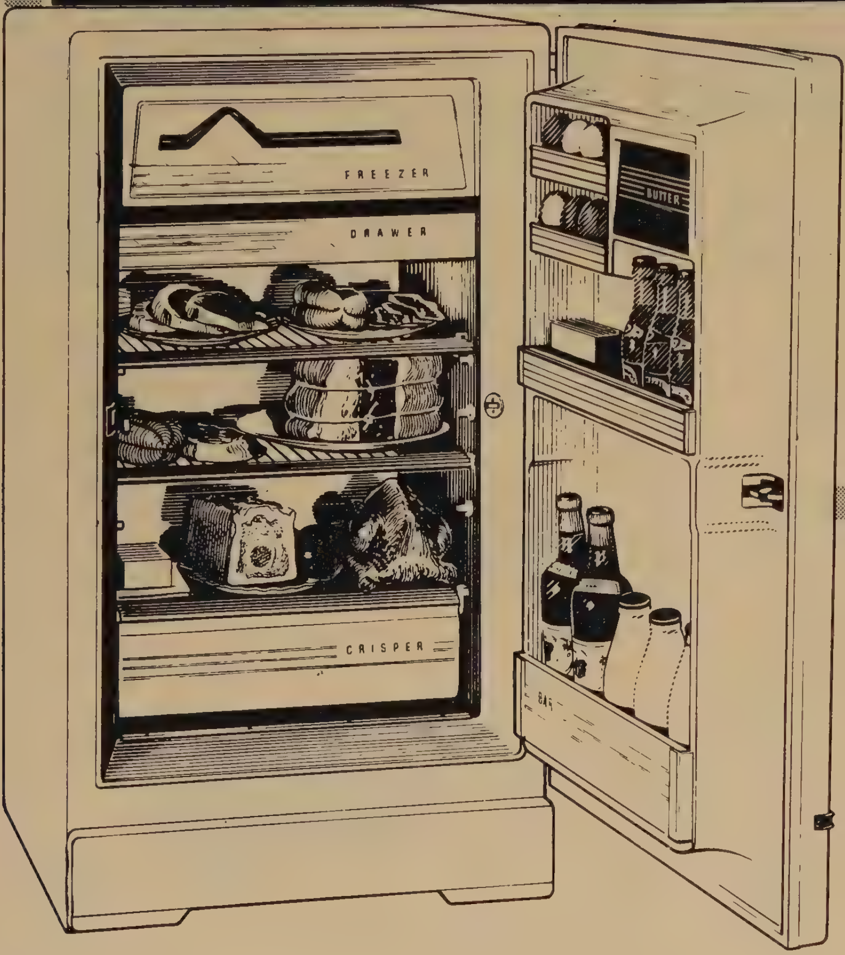


S.254



M.30

BENDIX REFRIGERATORS



Elegant and spacious

★ UNIQUE ANODISED ALUMINIUM ALU-FROID LINER, exclusive to Bendix, makes cabinet colder faster — saves running costs.

★ SILENT OPERATION assured by completely sealed unit.

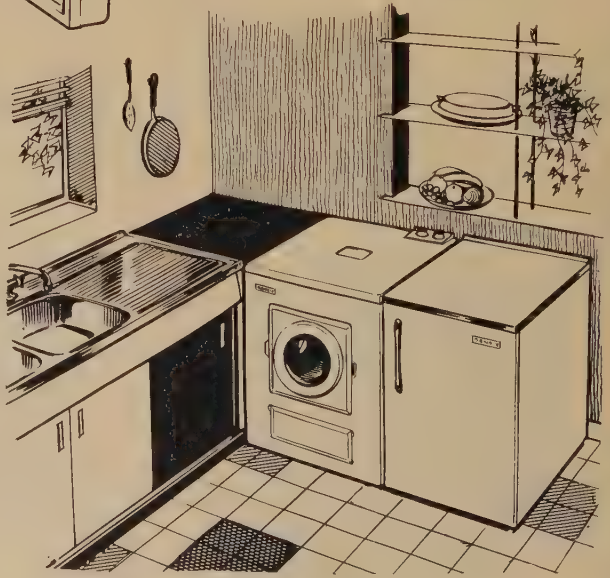
★ DAIRY BAR DOOR with Egg Rack, Dairy Compartment and Bottle Bar.

★ INTERIOR LIGHTING automatically operated by door's opening.

★ THERMOSTATIC CONTROL offers choice of ten temperature settings.

★ CHOICE OF COLOURS—Cabinets in white or cream, Table Top in yellow, green or grey.

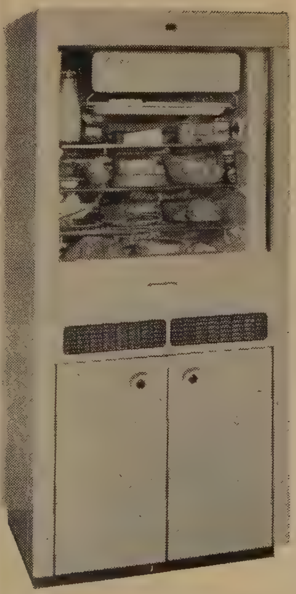
Model **983**	10 Cubic Ft. Capacity	Price **£125. 0. 0**
Model **683**	7 Cubic Ft. Capacity	Price **£99.15. 0**
Model **593**	6 Cubic Ft. Capacity	Price **£79.15. 0**
Model **401**	4½ Cubic Ft. Capacity	Price **£69.15. 0**
Model **301** (Table Top)	4 Cubic Ft. Capacity	Price **£59.15. 0**
Model **391**	3·7 Cubic Ft. Capacity	Price **£58. 5. 0**



Bendix Home Appliances Ltd. (Dept. T.E.), Albion Works, Kingsbury Road, Erdington, Birmingham 24

London Showroom: 481 Oxford Street, London, W.1. Tel.: Hyde Park 8351

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
FRIGIDAIRE DIVISION OF GENERAL MOTORS, LTD., **Stag Lane,** **Kingsbury, N.W.9.** *(continued)*	MZ–84	8·3 cu ft 15·8 sq ft	54½×27½×27¼	Interior light, frozen food compartment, 12-position cold control, porcelain on steel interior, hydrator	White, cream, green, pink or red	£100 18 7	£17 14 5
	DZ–84	8·4 cu ft 16 sq ft	54½×27½×27¼			£111 11 7	£19 13 5
	DZ–101	10·1 cu ft 18·3 sq ft	62¼×27½×27¼			£140 17 6	£25 0 6
GENERAL ELECTRIC CO., LTD., **Magnet House,** **Kingsway,** **W.C.2.**	DE.61	6·1 cu ft 12·5 sq ft	51×25¾×26¼	Interior light, bottle and egg racks, cheese and butter compartments in door panel	White or honeysuckle, choice of colours for handle insets	£76 9 6	£13 10 6
	DE.82	8·1 cu ft 15·7 sq ft	55¾×28×28¾			£95 11 6	£16 18 6
	" Coolspace " DE.44	4·3 cu ft 8 sq ft	36×21×23	Full-width freezer, chiller tray and salad drawer, interior light, magnetic door seal, heat and stain resistant work top	White or honeysuckle. Top red or blue	£55 7 6	£10 2 6
GENERAL STEEL WARES, LTD., **259, Marylebone Road,** **London, N.W.1.**	" McClary-Easy " C 14–16	14 cu ft 21 sq ft	63×30×30¼	Manual defrost, 1·4 cu ft freezer	White stoved enamel, turquoise porcelain enamel interior	£126 15 8	£20 11 8
	" McClary-Easy " ZD 14–16	14 cu ft 18·7 sq ft	63×30×30¼	Zero-zone freezer, automatic defrost, magnetic door catch, low temperature meat keeper		£160 15 4	£28 12 5
	" McClary-Easy " ZD 12–16	12 cu ft 15·7 sq ft	56×30×30¼			£150 18 11	£26 16 6
	" McClary-Easy " ZD 10–16	10 cu ft 9·7 sq ft	56×24⅛×30			£133 10 1	£23 12 9
	" McClary-Easy " Z 10–16	10 cu ft 10 sq ft	56×24⅛×30	Zero-zone freezer, automatic defrost		£117 4 8	£20 13 4
GRAMOPHONE CO., LTD., **Hayes,** **Middlesex.**	" Polar Star " GC4	4 cu ft 8 sq ft	36×21×21½	Coloured tops and interiors, magnetic door seals, L. or R.H. door openings	White or cream exteriors, blue/silver or maroon/beige interiors	£54 3 0	£9 18 0
	" Polar Star " GC5	5 cu ft 10 sq ft	36×23×23½			£61 5 0	£11 4 0
INDES REFRIGERATORS, LTD., **292, Streatham High Road,** **London, S.W.16.**	120 L	4·2 cu ft 7·5 sq ft	36×22½×21¼	Interior light, mounted on castors (automatic de-frost—225 L only)	White or cream, porcelain enamel interiors	£54 0 0	£9 15 0
	150 L	5 cu ft 9 sq ft	46¼×22⅝×22¼			£63 8 8	£11 10 4
	225 L	8 cu ft 12 sq ft	52¾×25×25¼			£79 3 8	£14 5 8



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13. *English Rose " Double Six " 6 cu ft refrigerator with vertical sliding door*

14. *G.E.C. 4·3 cu ft " Coolspace "*

15. *Frigidaire model DB-50 5·1 cu ft refrigerator from the " SheerLook " range*

16

16. Kelvinator model K46ZP 4·6 cu ft refrigerator with "Zero-Plus" freezer chest

17. Gramophone Co.'s model GC5 5·1 cu ft "Polar Star"

18. Indes model 150L 5 cu ft refrigerator

19. General Steel Wares model ZD.14-16 14 cu ft "McClary-Easy"

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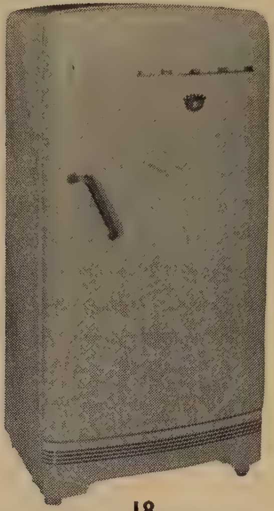

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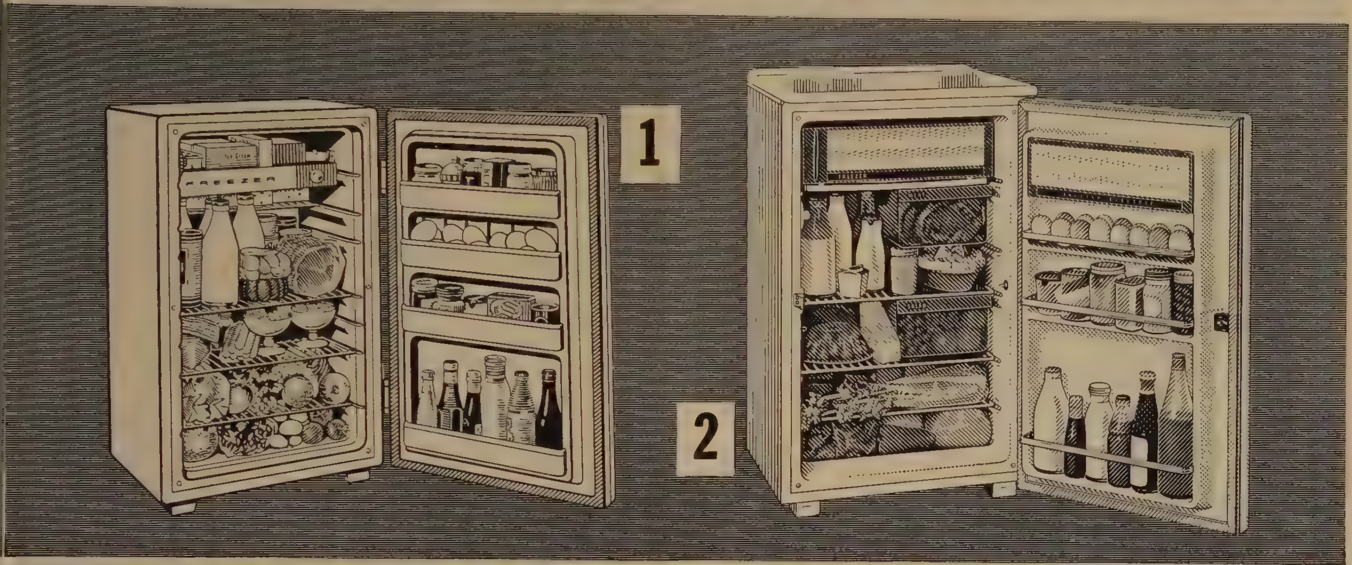
Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
KELVINATOR, LTD., **Great West Road,** **London, W.4.**	" Lady K "	3·1 cu ft 5 sq ft	$34\frac{7}{8} \times 19 \times 19$	Zero-plus extra low-temperature freezer chest, magnetic door seal	White or champagne ivory stoved enamel	£44 12 4	£7 17 8
	K.46 ZP	4·6 cu ft 8 sq ft	$34\frac{11}{16} \times 22\frac{13}{16} \times 23\frac{7}{8}$	Zero-plus extra low temperature freezer chest, interior light, moisture sealed crisper, Warerite table top (K.46 ZP), defrosting press button (K.77 M and K.94 M), automatic defrosting (K.94 MD)	White or champagne ivory stoved enamel	£59 17 3	£10 9 9
	K.60 M	6 cu ft 10·3 sq ft	$41\frac{1}{2} \times 22\frac{1}{2} \times 23\frac{5}{8}$			£71 8 3	£12 11 11
	K.77 M	7·7 cu ft 11·78 sq ft	$46\frac{1}{2} \times 24 \times 25\frac{7}{8}$			£91 12 4	£16 7 8
	K.94 M	9·4 cu ft 13·15 sq ft	$54 \times 24 \times 25\frac{7}{8}$			£106 6 0	£18 14 0
	K.94 MD	9·4 cu ft 13·15 sq ft	$54 \times 24 \times 25\frac{7}{8}$			£114 15 1	£20 4 11
	K.768	13·2 cu ft 18 sq ft	$65 \times 31 \times 29\frac{5}{8}$	Interior light, automatic de-frosting, food freezer separately insulated	White (special colours to order)	£217 7 3	£38 12 9
	EKV.10	10 cu ft 11·5 sq ft	$55\frac{3}{4} \times 24 \times 29\frac{3}{8}$	Holds 350 lb frozen food, 3 refrigerator fast freezing shelves	White	£139 5 5	£24 14 7
	" Foodarama "	18 cu ft	$63 \times 41 \times 25$	Interior light, automatic de-frosting, separate freezer holds 207 lb frozen food	White (special colours to order)	£338 8 3	£60 11 9
KENWOOD MFG. (WOKING), LTD., **Old Woking,** **Surrey.** *(continued on next page)*	" Kenwood Norge " KW.410	4·1 cu ft 7·2 sq ft	$36 \times 22 \times 22\frac{1}{2}$	Interior light, lift-up shelf, plastic interior	White stoved enamel	£55 6 11	£9 15 1
	" Kenwood Norge " KW.560	5·6 cu ft 9·7 sq ft	$45\frac{1}{2} \times 23 \times 22\frac{1}{2}$			£64 6 0	£11 6 0
	" Kenwood Norge " KF.12	12 cu ft 17·2 sq ft	$61\frac{1}{2} \times 28 \times 27\frac{3}{4}$	Interior light, automatic de-frosting, vit. enamel interior		£162 5 2	£28 16 10
	" Kenwood Norge " KF.13	13 cu ft 19·6 sq ft	$64\frac{1}{2} \times 31 \times 28$			£210 8 7	£37 7 5

DOUBLE EXCITEMENT! DOUBLE THE SALES!

WITH ENGLISH ELECTRIC SLIMLINE REFRIGERATORS



1 SLIMLINE JUNIOR—

The one small refrigerator that holds enough food

- Only $19\frac{7}{16}$ inches wide and $20\frac{5}{16}$ deep
- Only 32 inches high. Fits under draining boards and counter tops— into the smallest corner
- 6 square feet of shelf space
- Holds enough for a family of 4
- Stand available as optional extra brings it up to table-top height
- Costs just 48 gns.

2 NEW, ALL NEW, SLIMLINE 41

with the amazing full-width Deep-Cold freezer

- Full-width Deep-Cold freezer keeps frozen food for up to 3 months
- New deep meat/fish drawer keeps meat fresh longer
- $7\frac{1}{2}$ square feet of shelf-space
- Rollers at the back, so the Slimline 41 glides out for easier cleaning
- Tough-surfaced table-top is stain-, scratch- and heat-resistant
- All these big refrigerator features yet it costs just £66.3.0.

Both these Slimline Models have been best-sellers since they came on the market—and no wonder! They're streets ahead of the rest. They are being advertised on TV, in the press, in women's magazines right through the peak selling season, too. Double your sales with these doubly exciting refrigerators. Get in touch with your English Electric representative today.

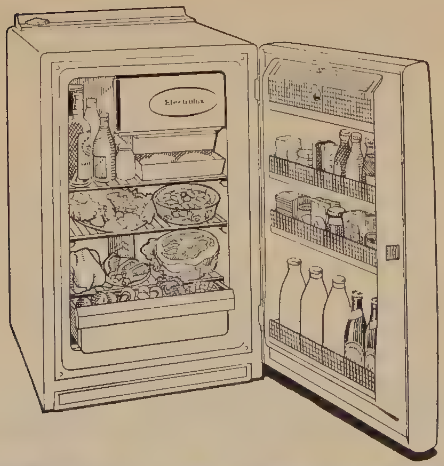
Do you have enough leaflets, 4-page Woman reprints, and display material? Better check today.

'ENGLISH ELECTRIC' SLIMLINE REFRIGERATORS

MADE TO LAST A LIFETIME!

THE ENGLISH ELECTRIC COMPANY LIMITED, DOMESTIC APPLIANCE DIVISION, LONDON AND LIVERPOOL

Designed for today, built for the years ahead
this year's most wanted refrigerator . . .



Electrolux L.40

8 sq. ft. shelf area, big frozen food compartment (holds 7 lb. for at least three weeks), 2 ice trays, full width vegetable drawer, butter and cheese compartments in door, adjustable door shelves—the Electrolux L.40 brings luxury to life. Here is a new Electrolux triumph of perfection and value. Permanently silent operation. Cooling unit guaranteed 5 years.

CASH PRICE 59 GNS
OTHER MODELS FROM 31 GNS.

Electrolux excels

ELECTROLUX LTD · 153/5 REGENT ST · LONDON W.1

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
KENWOOD MFG. (WOKING), LTD., **Old Woking,** **Surrey.** *(continued)*	" Kenwood " HR.52A	5·2 cu ft 9·6 sq ft	36 × 24 × 24⅜	Interior light, full-width freezer, castors, table-top optional extra	White stoved enamel	£59 17 3	£10 9 9
	" Kenwood " Home Freezer HF.42A	4·2 cu ft	36 × 24 × 24⅜	Interior light, packaged frozen food dispensers in door, castors, table-top optional extra		£65 3 10	£11 9 2
LAYFORD (ELECTRICAL), LTD., **7, Chesterfield Gardens,** **London, W.I.**	" Arthur Martin " 21–02	4 cu ft 7 sq ft	41 × 20 × 21	Interior light, door shelves, frozen food chest	White stoved enamel	£53 1 4	£8 17 8
	" Arthur Martin " 21–10	4·2 cu ft 6 sq ft	32 × 24 × 24	Table top of vitreous enamel, interior light, door shelves		£52 13 4	£9 17 6
	" Arthur Martin " 21–50	5·3 cu ft 8 sq ft	46 × 22 × 24	Interior light, door shelves, frozen food chest		£58 16 0	£11 0 6
	" Arthur Martin " 21–90	6·75 cu ft 12·5 sq ft	53 × 24 × 25			£67 9 5	£12 13 0
	" Arthur Martin " 22–50	9 cu ft 16 sq ft	59 × 28 × 25			£91 5 11	£17 2 3
F. & T. LEAT, LTD., **Ebberns Road,** **Hemel Hempstead,** **Herts.**	" Leatline " 3·6	3·6 cu ft 7·5 sq ft	36 × 21 × 21	Interior light, vit. enamel table top, adjustable feet	White stoved enamel. Coloured door panel available	£50 4 0	£7 11 0

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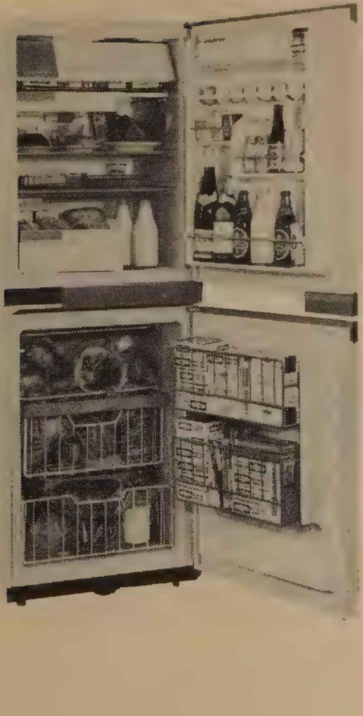

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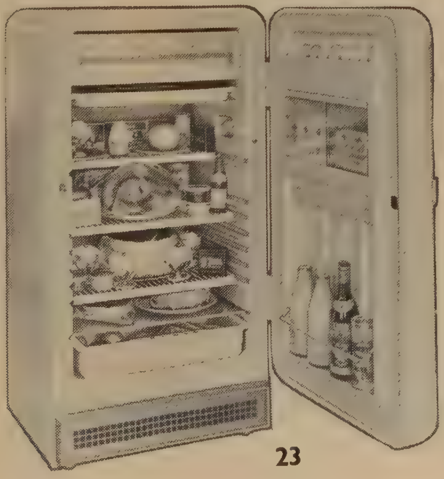

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20. *F. & T. Leat 3·6 cu ft " Leatline "*

21. *Layford model 21-50 5·3 cu ft " Arthur Martin " refrigerator*

22. *Kenwood HR52A refrigerator and HF42A home freezer shown as one unit*

23. *Lec model P.60 6 cu ft " International "*

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
LEC REFRIGERATION, LTD., **Bognor Regis,** **Sussex.**	"Coronet" P.20	2 cu ft 3·6 sq ft	27½×21½×20½	Pastel coloured door liner and interior, adjustable shelves	White or cream stoved enamel	£34 19 11	£5 19 1
	"Colonial" P.40	4 cu ft 6·7 sq ft	40½×23½×23			£44 8 3	£7 11 3
	"International" P.60	6 cu ft 10·7 sq ft	44×23½×26½	Interior light, full-width "Dewbin." Plastic interior (P.60). Aluminium interior (P.8 G)		£61 15 1	£10 13 11
	"Continental" P.8 G	8 cu ft 14·5 sq ft	57⅝×26½×27¼			£88 11 10	£15 7 2
	Home Freezer CF.25	5·4 cu ft	41×38½×23¼	Automatic alarm and locking handles available	White stoved enamel	£89 11 2	£15 8 10
	Home Freezer HF.40	4 cu ft	44×23×23½	Upright freezer, refrigerated shelves		£61 2 9	£9 17 3
LONOR, LTD., **1, Maddox Street,** **London, W.1.**	"Siemens" T.3/110T	4 cu ft 6·8 sq ft	33½×21×26	Interior light, lockable door, pale green interior	White stoved enamel	£50 13 10	£9 3 2
	"Siemens" T.3/140	5 cu ft 10·2 sq ft	42×22×26¼			£67 11 10	£12 4 2
	"Siemens" T.3/260	9·3 cu ft 17·8 sq ft	54½×28×24			£112 19 0	£20 8 0
	"Siemens" KT/115A	4·1 cu ft 7·1 sq ft	33½×21×26			£59 5 0	£10 14 0
	"Siemens" KT/145A	5·1 cu ft 10 sq ft	33½×26¼×23½			£66 13 2	£12 0 10
PRESTCOLD DIVISION, PRESSED STEEL CO., LTD., **Swansea,** **Glamorgan.**	"Packaway Three" D.302 and DW.301	3·1 cu ft 5·7 sq ft	33½×20⅞×19¼	Magnetic door-seal. Tray top in 3 colours. Can be wall-mounted (DW.301)	White or cream. Blue/white/black interior (D.302). Blue/white interior (DW.301)	£44 13 11 (D.302) £43 16 1 DW.301)	£7 16 1 £7 12 11
	"Packaway Five" D.521	5·2 cu ft 11 sq ft	34⅞×23⅞×23¾	Magnetic door-seal, interior light, rear wheels, work top in three colours	White or cream. Black ext. trim. White/blue/black interior	£58 17 11	£10 8 1
	"Packaway Eight" D.811	8·1 cu ft 15·3 sq ft	53¼×26×24	Full-width frozen food locker, interior light, 2 ice trays, on wheels		£79 9 5	£13 19 7
	"Automatic Nine" T.901	9 cu ft 12·5 sq ft	56⅜×27⅛×27	Interior light, automatic de-frosting, deep freezer, 3 ice trays	White or cream, white/blue interior	£122 19 11	£21 15 1
SIMPLEX ELECTRIC CO., LTD., **Creda Works,** **Blythe Bridge,** **Staffs.**	"Creda" 300	3 cu ft 5·6 sq ft	33×19½×20⅞	Recessed door handle, door open within own width, large door panel store, heat-proof table top (interior light 475 only)	White or cream stoved enamel. Coffee-coloured plastic interior	£45 19 6	£8 12 6
	"Creda" 475	4·75 cu ft 8·5 sq ft	36×23¼×22¼			£58 7 2	£10 18 10

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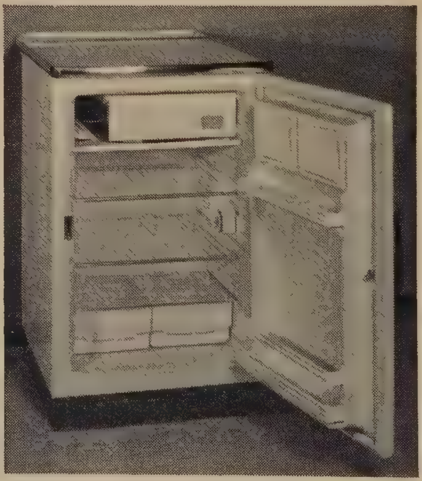

25

24. *Prestcold "Packaway Eight" 8·1 cu ft refrigerator*
25. *"Siemens" model T3/110T 4 cu ft refrigerator (Lonor, Ltd.)*

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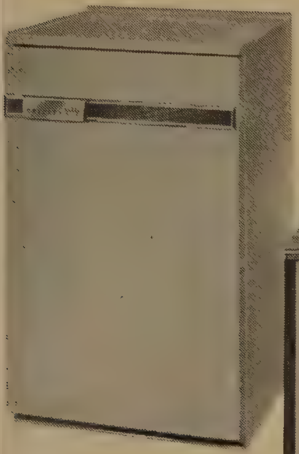

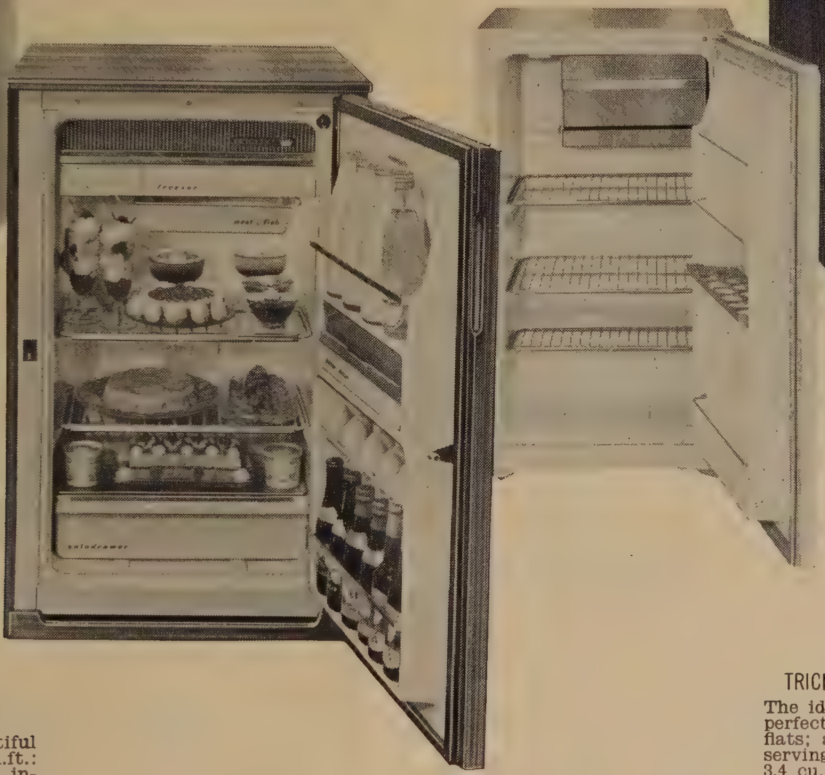

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TRICITY 'DINER-COLD'

the *only* refrigerator specially designed for dining-room, hall or lounge: wood cabinet in glowing sapele veneers with glass-hard polyester finish: 4.5 cu.ft.: compressor type refrigeration unit: large freezer compartment: special storage spaces for dairy produce, fats, meat/fish: spacious door storage for bottles etc. with tuck-away egg rack. Price 69 gns.

TRICITY 'KITCHEN-COLD' JUNIOR

a wonderfully compact refrigerator, ideal for installation beneath working tops; amazingly large capacity with exceptional freezer space; well planned door storage and adjustable shelves make maximum use of every inch of space; compressor type refrigeration unit. 3.4 cu.ft. Price 48 gns.

TRICITY 'DINER-COLD' JUNIOR

The ideal 'second' refrigerator, perfect too for small homes and flats; and for straight-to-table serving of cold drinks and sweets; 3.4 cu.ft.; finished in beautiful sapele (high gloss or satin finish) or walnut veneers; compressor type refrigeration unit.

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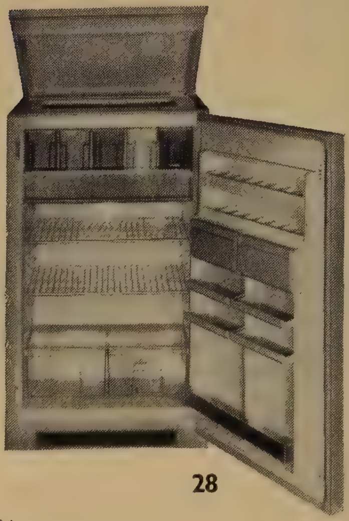

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26. *Tricity Cookers "Diner-Cold" 4·5 cu ft refrigerator*

27. *Simplex "Creda 475" 4·75 cu ft refrigerator*

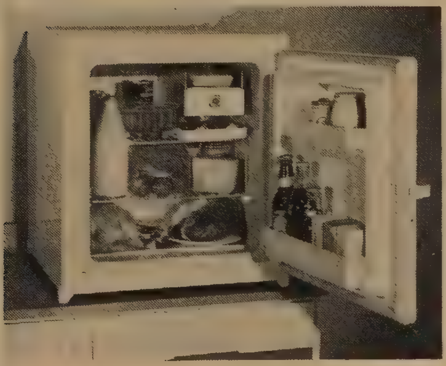
28. *A.E.G. "Frigomat" model 200 S 7 cu ft refrigerator (Welmec)*

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
TRICITY COOKERS, LTD., **Thorn House,** **Upper St. Martins Lane,** **London, W.C.2.**	" Dinercold "	4·5 cu ft 9·1 sq ft	36 × 22½ × 24	Magnetic door lock, interior light	Wood " Sapelle " veneer cabinet, polystyrene interior	£61 5 1	£11 3 11
	" Dinercold " Junior	3·4 cu ft 7·2 sq ft	34½ × 21 × 20	Magnetic door lock		£50 12 0	£9 5 0
	" Kitchencold "	4·5 cu ft 9·1 sq ft	36 × 21½ × 23½	Magnetic door lock, interior light	White or ivory stoved enamel, lilac polystyrene interior	£53 5 3	£9 14 9
	" Kitchencold " Junior	3·4 cu ft 7·2 sq ft	33 9/16 × 19½ × 19	Magnetic door lock		£42 12 3	£7 15 9
WELMEC CORPORATION, LTD., **147-8, Strand,** **London, W.C.2.**	AEG 120	4·25 cu ft 8 sq ft	33½ × 20¼ × 22½	Interior light, magnetic door lock, full-length handle (automatic defrost and 1 cu ft deep-freeze compartment, 200 S only)	White, with blue plastic door racks and interiors	£51 9 9	£9 8 3
	AEG 150	5·25 cu ft 9·1 sq ft	33½ × 21½ × 23¾			£55 18 6	£10 4 6
	AEG 190	6·5 cu ft 12·9 sq ft	44¾ × 22¾ × 25			£75 9 1	£13 15 11
	AEG " Frigomat " 200 S	7 cu ft 12 sq ft	43 × 25 × 25			£109 3 9	£19 19 3

ABSORPTION

COLDETTE REFRIGERATION, **11, Dafforne Road,** **London, S.W.17.**	" Cadet "	3 cu ft 5·5 sq ft	35 × 21 × 23	Suitable for dining room or lounge	Oak, mahogany or walnut	£49 0 0	£8 13 0
DENHAM & MORLEY, LTD., **173-5, Cleveland Street,** **London, W.1.**	" Denmore " 25	2·5 cu ft 4 sq ft	30½ × 21½ × 24	Interior light, Formica working top	White stoved enamel	£42 3 4	£7 14 2
DORSET REFRIGERATION CO., LTD., **Lake Road,** **Hamworthy,** **Poole, Dorset.**	" Wallis "	2·25 cu ft 5·1 sq ft	41 × 23 × 25½	Vitreous enamelled working top, plastic door racks	White stoved enamel, eau-de-nil trim	£42 18 4	£9 5 3
ELECTROLUX, LTD., **153-5, Regent Street,** **London, W.1.**	" Sixteen "	1·6 cu ft 3·25 sq ft	21 9/16 × 19½ × 21	For wall fixing or for mounting on a cabinet or stand (optional extra 2 gns.)	White stoved enamel	£27 8 3	£5 2 9
	De Luxe 26	2·6 cu ft 5·5 sq ft	31⅞ × 20¾ × 23¾	Gold band decoration, " TrayTop " available as optional extra, frozen food compartment storage up to 3 weeks, door storage	White or cream stoved enamel	£41 11 2	£7 15 10
	L.37	3·7 cu ft 7·25 sq ft	36¼ × 21¾ × 24¾			£47 14 11	£8 19 1
	L.40	4 cu ft 8 sq ft	36 × 22⅞ × 24½			£52 3 4	£9 15 8
	L.50	5 cu ft 10 sq ft	53¼ × 26¾ × 27¼	Interior light, full-width frozen food compartment storage up to 3 weeks, door storage	White or cream stoved enamel	£81 8 3	£15 5 4
	L.76	7·6 cu ft 14·25 sq ft	58½ × 30½ × 28⅝			£106 2 7	£19 18 0

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., **Magnet House,** **Kingsway,** **London, W.C.2.**	DE.250A	2·6 cu ft 5·6 sq ft	32¾×21¼×24½	Polystyrene interior, removable racks and shelves	White or honeysuckle	£41 14 5	£7 12 7
JOHN HARPER & CO., LTD., **Albion Works,** **Willenhall,** **Staffs.**	" Harper "	2·5 cu ft 4 sq ft	28×22×24¾	Plastic interior, suitable for wall mounting or free standing	White stoved enamel	£40 7 10	£7 7 8
HELIMATIC, LTD., **22-24, Buckingham Palace Road, London, S.W.1.**	" King-Cold " 18520–22	1·9 cu ft 4 sq ft	26¾×21½×21¾	Built-in type, several containers in door, white or grey plastic interior	White plastic door with ventilation grilles above and below	£43 18 3	£7 16 5
	" King-Cold " 18554–56	3 cu ft 4·2 sq ft	34⅛×21¾×23¼			£48 14 2	£8 13 11
	" King Cold " 18566–68	3 cu ft 4·2 sq ft	34⅛×21¾×23¼			£52 4 3	£9 6 6
	" King Cold " 18604–06	4·3 cu ft 7·6 sq ft	42¼×21¾×23¼			£63 17 3	£11 8 2



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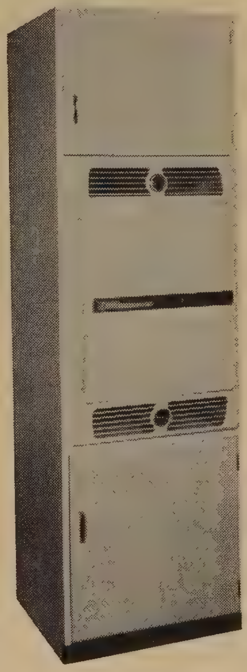
29. *Electrolux " Sixteen " 1·6 cu ft refrigerator*
30. *Coldette " Cadet " 3 cu ft refrigerator*
31. *Harper 2·5 cu ft refrigerator*
32. *Helimatic 3 cu ft " King Cold " built-in refrigerator in " Hygena " kitchen unit*



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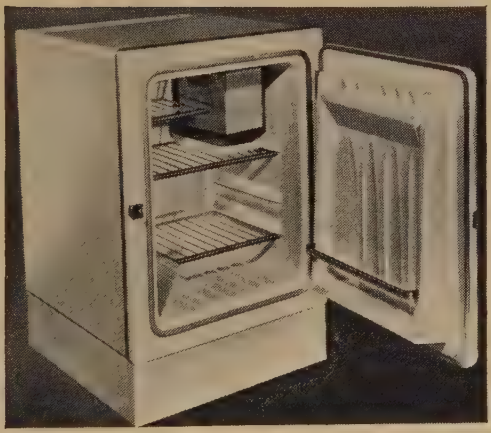

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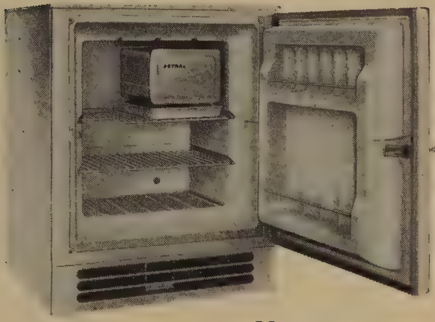

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33. Morphy-Richards "Starlet" 1·6 cu ft refrigerator

34. Radiation "Jackson 202" 2 cu ft refrigerator

35. Main "24" 2·4 cu ft refrigerator

36. G.E.C. model DE250A 2·6 cu ft refrigerator

34

35

36

Manufacturer or Distributor	Model	Cubic Capacity and Shelf Area	External Dimensions (H., W. & D. in inches)	Special Features	Finish	Price (excl. tax)	Purchase Tax
LONOR, LTD., **1, Maddox Street,** **London, W.1.**	"Siemens" AKT/80	2·8 cu ft 6·3 sq ft	33½×21×23	Interior light, lockable door, plastic interior	White stoved enamel	£35 2 7	£6 6 11
R. & A. MAIN, LTD. (ELECTRICAL DIVISION), **48, Grosvenor Gardens,** **London, S.W.1.**	"Main 24"	2·4 cu ft 5·4 sq ft	36×21×21	Light blue plastic interior, adjustable shelves	White or cream stoved enamel, red trim	£37 0 7	£6 15 5
MORPHY-RICHARDS (ASTRAL), LTD., **50, Conduit Street,** **London, W.1.**	"Astral Starlet"	1·6 cu ft 3·1 sq ft	25½×21½×22	Door storage, L. or R.H. door opening	White stoved enamel	£24 15 7 £1 9 6 (Legs)	£4 12 5 —
	"Astral Table" A.200 A	2 cu ft 4·2 sq ft	25½×21¼×21¼	Adjustable shelves, door racks, frozen food accommodation	White or cream stoved enamel	£30 19 6 £1 9 6 (Legs)	£5 15 6 —
	"Astral Commodore" A.400 D	4 cu ft 8 sq ft	41½×22½×24			£39 16 6	£7 8 6
	"Astral Table Top" A.350	3·5 cu ft 7·1 sq ft	35½×22½×23¼	Vitreous enamel working top, magnetic door-seal, frozen food accommodation, L. or R.H. door opening		£37 3 4	£6 18 8
	"Astral Built-in" A.160	1·6 cu ft 3·1 sq ft	31×21×22	Door storage, L. or R.H. door opening		£27 7 10	£5 2 2
PAKAMAC (SPECIAL PRODUCTS), LTD., **Moorside,** **Oldham,** **Lancs.**	"Pakamatic" 400	4 cu ft 7·75 sq ft	36¾×22×25½	"Melamine" table top, ice-blue polystyrene interior	White stoved enamel	£46 3 2	£8 8 10
	"Pakamatic Pelican" 280	3 cu ft 5·4 sq ft	35×21×23⅜	"Melamine" table top, ice-blue or lilac polystyrene interior		£39 1 2	£7 2 10
RADIATION, LTD., ELECTRICAL DIVISION, **255, North Circular Road,** **London, N.W.10.**	"Jackson" 202	2 cu ft 3·4 sq ft	27⅞×21½×21½	One-piece "Astralon" plastic cabinet. Price includes table top and legs or wall-mounting kit.	White	£25 3 2	£4 14 4

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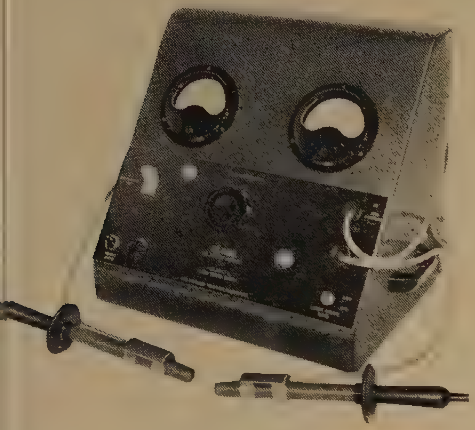

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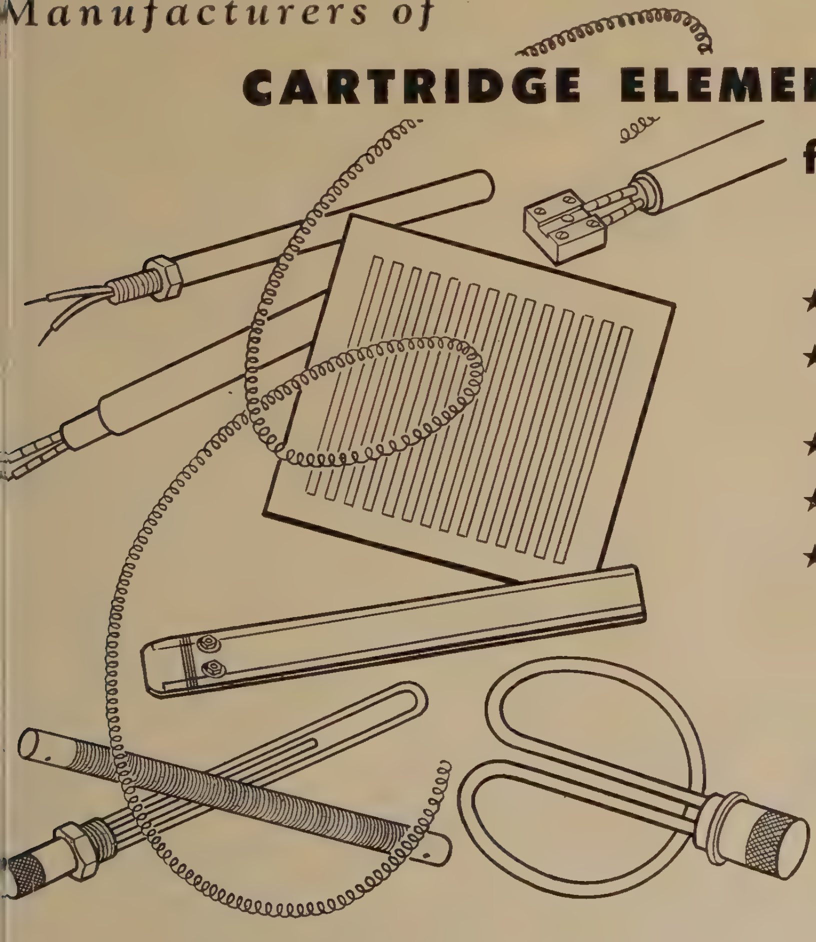

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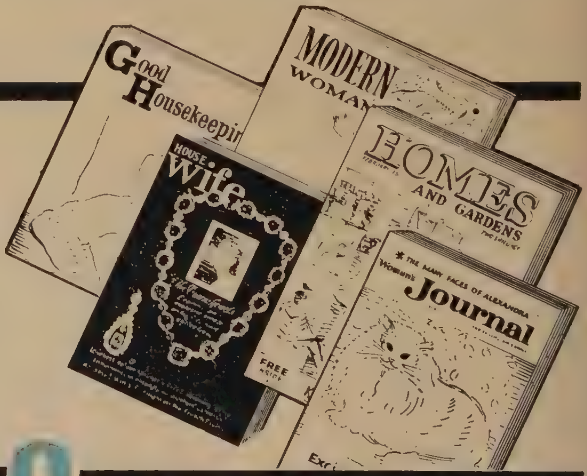

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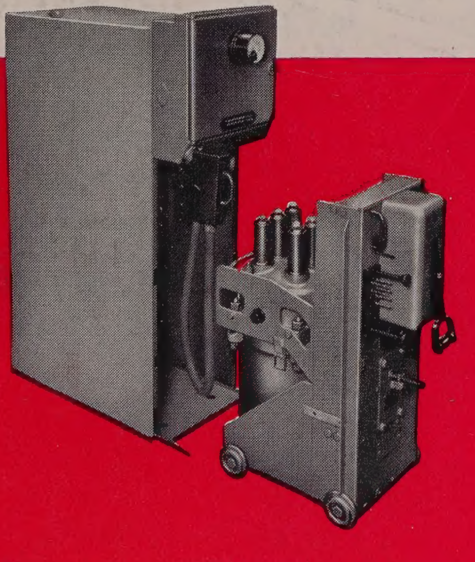
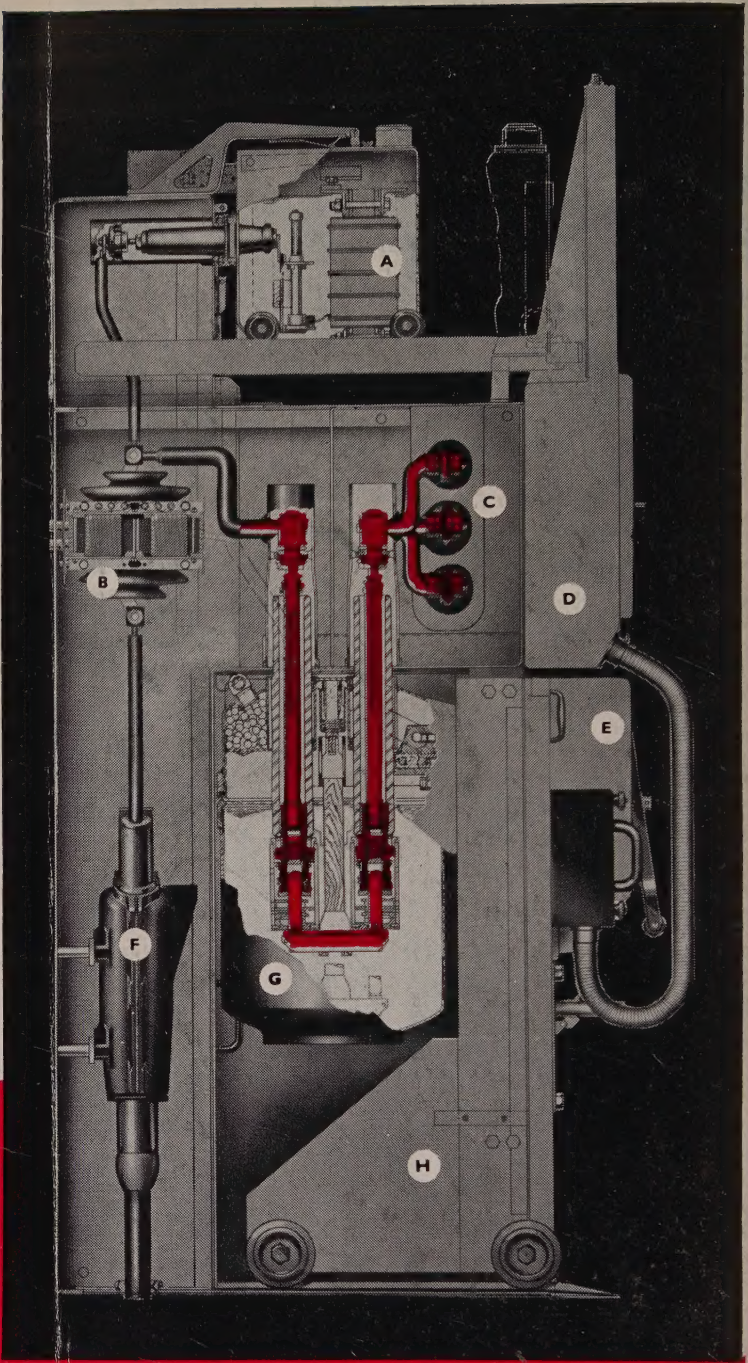


Single unit—circuit-breaker withdrawn



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